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To the
Top of the Continent

Discovery, Exploration and Adventure
in Sub-arctic Alaska. The First Ascent
of Mt. McKinley, 1903-1906

By

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Illustrated from photographs by the author,
a frontispiece in color, drawings, and maps



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INCLUDING THE SCANDINAVIAN

TO THE LITTLE PARTY AT HOME
WHO PATIENTLY AWAITED
OUR RETURN

ACKNOWLEDGMENT

THE AUTHOR AND PUBLISHERS WISH TO THANK MESSRS. HARPER AND BROTHERS FOR PERMISSION TO REPRODUCE THAT PART OF THE TEXT AND SEVERAL OF THE ILLUSTRATIONS WHICH ORIGINALLY APPEARED IN "HARPER'S MAGAZINE."

INTRODUCTORY

IN THE development of the project for the conquest of the mountain which this volume narrates, a series of barriers arose which seemed almost unsurmountable. A great mountain was rediscovered in an unexplored district and christened in honour of our late President, William McKinley. Preliminary investigation proved this mountain to be the highest peak in North America. Hidden in the heart of Alaska, far from the sea, far from all lines of travel, this newly crowned alpine rival pierced the frosty blue of the Arctic within reach of the midnight sun. The recognition of the pre-eminence of this peak, together with its fitting designation, framed a national mountaineering challenge which we took up fully realising the strenuous task which it entailed. The mere effort of getting to the base of the mountain with sufficient supplies to prolong the siege required the exploration of thousands of miles of trackless wilderness. Unlike most other big mountains this giant uplift rises suddenly out of a low country and the climb begins over ice torn by crevasses and weighted down by sharp stones. Above were 19,000 feet of unknowable troubles, wherein the rush of the crumbling,

tumbling earth with its storms and snows must be guarded against. Such an expedition involved most of the difficulties of arctic travel and all of the hardships of high alpine ascents multiplied many times, but with the working incentive of pioneer adventure, and with the spiritual exhilaration of discovery, all these obstacles, it was hoped, would eventually be bridged.

Mountaineering as we assume it in this venture is a department of exploration, and as such it is worthy of a higher appreciation than that usually accorded it. Among our British cousins there has long been an admirable spirit of mountain adventure which has developed into a well-defined sport. In America there has recently grown a similar appreciation of alpine ascents. This is made clear by the vigorous growth of the Alpine, the Appalachian, the Mazama, the Sierra, and other mountain clubs. Mountaineering is too often put down as a kind of dare-devil sport, of risky feats on cloud-piercing pinnacles; but in climbing there is an inspiration expanding with the increase of vision which is capable of much development. In the records of high ascents there is not only the glory of the pioneer spirit of conquest, but also data for scientific research as well as fascinating studies in art. When primitive man climbed the nearest hills to get a better view of the animals he sought, the sport of climbing began. When he extended this climb to higher hills to note the lands beyond, then the science

of geography was born, but when he returned and conveyed to others not only the glory of his enlarged horizon but the spirit of the outlook then the climbers' art was established. The succeeding generations, wandering into new areas and expecting always the end of the world just beyond the horizon, have climbed mountains that they might see into the mysterious lands beyond. Seeing no abrupt termination, men have moved on, have climbed other mountains, have looked farther over the globe, until to-day there is the prospect of wireless telegraph stations reaching from peak to peak, from pole to pole.

The mountain climber and the arctic explorer in their exploits run to kindred attainments. The polar traveller walks over uniform snows, over moving seas of wind-driven ice; his siege is long and his main torment is the long winter darkness. The mountaineer reaches heavenward over the snows of cloudland. His task is shorter but more strenuous and his worst discomfort is the task of breathing rarefied air. In the general routine, however, both suffer a similar train of hardships, which hardships are followed by a similar movement of mental awakening, of spiritual aspirations, and of profound and peculiar philosophy. Thus the stream of a new hope, of dreams and raptures is started, and this stream seeks a groove down the path of life for ever after. It follows that he who ventures into the polar arena or the cloud battlefield of high mountains will

long to return again and again to the scene of his suffering and inspiration. This return habit or migratory spirit is a curious study in one of the first primitive instincts and its most potent factor is the joy of discovery and exploration. Mountaineers and polar explorers are thus members of a widely separated family, and they should be brought closer together as brothers in a new school of pioneer adventure. We have much to learn of each other.

The exploration of the Alaska Range was not seriously attempted until the Klondyke stampede of 1897 indicated the mineral prospects of the adjoining territory. Gold had earlier been found in the Cook Inlet district but the interior from the Inlet to the Yukon was a *terra incognita*. With the surprising speed of the new gold rush various government reconnoissance expeditions were directed into this area of mystery. At about the same time the gold diggers pressed up the Susitna and among them was W. A. Dickey, who in 1898 sighted a big peak, christened it Mount McKinley, and guessed at its altitude with surprising correctness as 20,000 feet. A sketch of the mountain with notes was sent to the *New York Sun* and the data thus falling into the hands of the noted geographer Cyrus C. Adams were placed on record.

A good deal has been said bearing on the wisdom of placing a modern name over a landmark that would seem to have been recognised and named

for ages. We have taken much trouble to clear this point, but up to the present have been unable to trace a name which was previously used to specifically designate this particular peak. The Russians applied the name *Bolshoy*, meaning big, to many high mountains, and this name was given to the peak in question with its companion peaks in the central group. Thus *Bolshoy* was the general name for the highest section of the Alaska Range. The Susitna Indians gave the name *To-lah-gah* to the same group. Therefore the new name Mt. McKinley finds a proper setting to a fitting monument as a token of appreciation to the memory of one of our greatest statesmen.

The titanic slopes of ice and granite of this most majestic of American summits rise out of the low wet wilderness of mid-Alaska, dividing the game and gold countries which will soon be trailed by the prospector and the nimrod, dividing also the tributary waters of the Yukon, the Kuskokwim, and the Susitna, Alaska's greatest rivers. From the west the giant cliffs rise suddenly out of an ancient glacial shelf extending hundreds of square miles. Here good grass is found in abundance, and herds of caribou graze along the edge of the timber line. At the heads of countless glacial streams the moose nibbles sprigs. In the endless fields of blueberries the huge grizzly bear grunts in peace, and along the foothills in great white zigzags the snowy mountain sheep climbs to untroubled joys. To the north-east and

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south-west the higher slopes are continuous with a narrow saw-toothed ridge ten thousand feet high. The approaches from the north and east are guarded by a wide belt of mountains rising to altitudes of twelve thousand feet, but from the south-east there is an unobstructed view. From the banks of the Susitna River the mountain stands out a huge succession of cliffs weighted down with all the snow it can possibly carry. Many glaciers receive the ceaseless downpour of avalanches from the misty heights, and these glaciers extend to amphitheatres where the clouds deposit their frozen vapours carried from the warm Japan current.

The task of getting to the base of this mountain is a prodigious venture which offers very many difficult obstacles to the transportation of men and supplies. The prospective conqueror of this immense uplift must pick his path through forest and marsh, to one of its many glaciers, and then begin the climb at 2000 feet or lower. He ascends for miles over sharp broken stones and then up a slope of séracs and arêtes, around gloomy cloud-rubbed rocks, up into the most desperate cold that man has encountered.

We tried not to underestimate the arduous task or the unavoidable hardships of our assumed mission. Months were spent in preparation to use human energy to the best advantage and with the greatest economy. Our ultimate success was due mainly to this preliminary preparation. For

the purpose of our enterprise the usual mountaineering equipment was quite impossible, for our limited means of transportation, and likewise the assistance of alpine guides seemed of doubtful value because of the prolonged task of difficult exploration in low countries before the alpine work was to begin.

The food and fuel supply for a prolonged ascent over icy slopes will always prove a difficult problem. In this phase of our work we were greatly helped by the experience in polar effort. After many years of experiment I have about concluded that all the gastronomic needs are best supplied by pemmican, biscuits, and sugar. A few minor accessories might be added but this is all that is absolutely required. For fuel we burned wood below 3000 feet, kerosene for the preliminary exploration among the foothills, and alcohol for the high camps.

The entire equipment for the climbing expedition differed radically from that usually carried, but the special things which led to success were a light Shantung silk tent and a combined robe and sleeping bag, together weighing but eight pounds.

With this refinement of climbing equipment we were able to be independent of guides and of porters, for the necessary weights which we transported were so reduced that with fifty pounds on each of our backs we were completely outfitted for a campaign of two weeks. It is not often that a more prolonged siege is necessary from a base camp.

For the pioneer work of the low country we were guided by the experience of the exploring parties of the U. S. Geological Survey and the needs of the prospectors. Our food supply here was flour, bacon, beans, and the various accessories which the gold diggers have found best. For transportation we secured pack horses east of the Cascade Range; semi-wild, hardy animals that endured the hardships of Alaska very well. For river transportation we built a special river boat able to cope with shallow swift streams. This double system of transportation was of vital importance to us.

In the run of failures and successes which marked our conquest, I was nobly supported by two loyal parties of able assistants. No great task of exploration can succeed without a strong bond of helpfulness extending to the leader and to the family of workers. The unselfish energy expended by every man in my parties was very commendable. We did have our minor differences, but in the main the interest in the success of each expedition was ever foremost. To these men and to a number of warm friends who at home have assisted in the enterprise is due a large measure of praise.

FREDERICK ALBERT COOK.

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PART I
THE EXPEDITION OF 1903

TO THE TOP OF THE CONTINENT

CHAPTER I

WITH THE BREATH OF THE TROPICS INTO THE ARCTIC

WE HAD planned to go to the top of the continent, to the summit of Mt. McKinley. This is, perhaps, the most inaccessible of all the great mountains of the world; but it is also the centre of one of the most fascinating areas of rugged wilderness. The huge ice-corniced granite cliffs rise in successive tiers out of a gold-strewn low country, over which wander bear, moose, caribou, and other big game animals. The middle slopes are swept by a sea of storm-driven clouds, and above, far above the usual cloud line, there is a new world of silent glory and snowy wonder. Peak upon peak, range upon range, the great uplift continues to rise into the blackness and mystery of the arctic heavens. Our route is through primeval forests, across and against rushing glacial

streams, over marshes and tundras, on to tumbling glacial ice, up into the frosty mist of the upper world. The obstacles are many, but the splendid prospective achievement of the conquest is in fair proportion to the magnitude of the task.

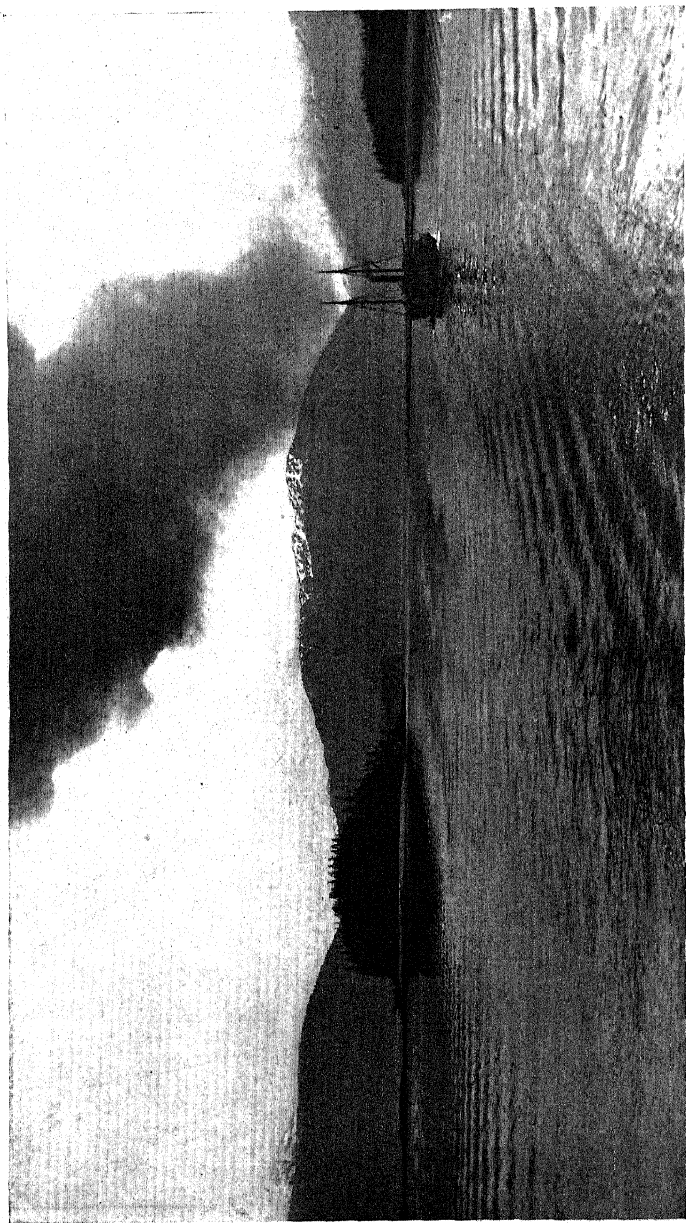
Alighting from the luxurious Northwestern Limited we began our conquest by a jaunt into the primitive at North Yakima. Here we secured from the Indians fifteen pack-horses of the kind which we believed to be best adapted to the rough life of Alaskan mountaineering. The Yakima cayuse has a hard struggle for subsistence in high sterile country, and if properly trained and of good size he works well and endures the northern hardships with less chances of breaking down than animals raised in an easier environment. At Seattle we spent many anxious days in selecting food and equipment. We found the prices there reasonable, and the tradesmen admirably prepared to fit out such ventures as ours.

In due time the expedition with its many needs was on board the quaint Alaskan coaster, the steamer *Santa Ana*. The ropes were cast off at dawn on the morning of June 9, 1903, as the whistles started a run of noises that must have awakened the whole town. Men were on the docks cheering for their parting comrades en route to the new Eldorado of gold and hope; men on board were giving a parting shout to their less ambitious fellows ashore. All of this human howl was followed by a chorus from horses, cattle, pigs, dogs,



FREDERICK A. COOK, M. D.

F. A. Cook



ALONG THE ALASKA COAST NEAR SITKA

and chickens on board, giving a taste of wild, animal excitement in keeping with our mission. We were soon gliding over the silvery surface of Puget Sound and, as the dark spirals of smoke rose from the city through the still balmy air into cloudless skies, we got a superb glimpse of the huge forests along the shore-line, and, far beyond, the magnificent snow-crested peaks of the Coast Range. Mt. Tacoma with its poetic mountain solitude, and its sublime vapour drapery of purple and gold, was slowly sinking into the broad green expanse. All on board were on deck dreaming of Alaska and the return a few months hence with pouches of gold and a wealth of other hopes. Good weather followed while the landscape improved with our progress "down north and up along." The rugged, snowy heights of Vancouver Island, ever wrapped in storm-clouds, made a striking contrast to the sunny, quiet waters of the inland sea which laps the soft green shores of British Columbia. Thus we followed the warm, vapour-charged breezes, the breath of the tropics, along the evergreen shore-line of Alaska with the northward sweep of the Pacific into the icy air of the Arctic.

A short stop was made at Juneau early in the morning of the fourth day, and from there delightful weather followed us to Sitka. During the night we steamed easily among the magnificent mountains under a sky ever changing from tones of blue and purple, the prow sending up ripples in

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glittering waters which reflected the snowy peaks of the arctic world in close contrast to the dense green verdure along tempting shore-lines. The night effect was nearly that of the higher polar zones. There was its silvery brightness, its inspiring stillness, its elusive grandeur, plus the joys of dense forests but without frigid discomforts. Near Sitka we saw two little deer sporting on a sandy beach apparently unconcerned at the sight of a big ship with its noise and smoke.

Sitka is the most picturesque and the most original of the coast towns of Alaska. Its numerous historic reminiscences, its church, its old Russian architecture, and its totem poles, will long make it a mecca for tourists, but as a business town the outlook is not cheerful. The fur trade is no longer profitable, its fisheries are controlled by large canneries. The rival mining excitement in other cities has left Sitka a lonely town interesting for its life of a past decade.

On leaving Sitka most of us went to bed to await Neptune's call, for here we plunged from the quiet inland waters into the always unruly waters of the Gulf of Alaska. The weather proved unexpectedly good, and the *Santa Ana*, though her decks were crowded with lumber, coal, cattle and horses and other live stock, rode the big seas with ease and grace while Captain Schage, ever on the alert for the comfort of his charges, made life easy and interesting. Early in the morning of the 15th the curtain of mist was raised from the Fairweather

Range. During the night the needle peaks of Baranoff Island vied with the easy slopes of Edgecomb volcano for notice, but now the giant snowy crests of this unknown cluster of great peaks compelled our attention. At the sound of the ship's triangle at eight, we paced the decks and discussed the principal peaks of the Fairweather and St. Elias groups. Mt. Fairweather was in all its glory of glitter and colour. A bunch of pearly clouds partly screened the sun, allowing silvery beams of light to dart upon glacial slopes, while the waters near the ship were strewn with spouting whales. Mt. Fairweather resembles Mt. McKinley in its general environment and also in main outline. We noted three possible routes to its summit and plotted the mountain for a possible future exploration.

Mt. St. Elias with its companion peak Mt. Logan and the great maze of glaciers and lesser mountains next took our attention. Mt. St. Elias is a huge pyramid rising out of an immense area of glacial ice about forty miles from the sea, while Mt. Logan, a great whaleback of snow in Canadian territory, twenty-five miles beyond St. Elias, among a sheen of giant peaks, is plainly noted as the greatest of the coast peaks. Mt. Logan is over 19,000 feet high and is therefore the second highest peak in North America. Its ascent and exploration offer many difficulties because of the arduous task of approaching its base. Nevertheless, if supplies were moved to

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the base in the end of February and early March, the lower areas might then be explored while food caches were appropriately placed, and later the final climb might be made by a quick assault.

The coast from Mt. St. Elias to Port Valdez is less picturesque, but more useful. Placer gold, copper, coal, and petroleum are among the minerals which have just at present created a boom. No less than four railroads are here in the course of construction, all aiming at the resources of the interior of Alaska, but mostly the copper of the Copper River Valley. Two of these roads are to start from points near the delta of the Copper River, one from Valdez, and one from Seward. Each terminus has had, or is expected to have, its boom. Valdez was made to survive while its railroad was being projected on paper; later, the town discovered itself, made a trail to Fairbanks, located copper in Prince William Sound, and now the people have a substantial town which originally was little more than a hope for the future. The same can be said of Seward.

With a lighter cargo and less animal life we steamed over the mirrored waters of Prince William Sound with its fascinating reflections of glaciers and snow-streaked mountains, around Kenai Peninsula into the great gulf named in honour of its discoverer, Captain James Cook, Cook Inlet. A delightful run of a few hours among grassy islands where blue foxes are farmed took us to Seldovia. This harbour is a quaint little

basin surrounded by a few Indian log huts with grass thatched roofs, a Russian church, and several trading sheds.

We left Seldovia with the first glimmer of dawn, aiming to catch the ingoing tide at Anchor Point. The night was cloudy, but now the sky cleared and a warm glow spread over the cold waters of Cook Inlet. Mt. McKinley, two hundred and forty miles northward, was just visible, a mere tooth of ice biting the arctic skies. The volcanoes, Chinabora, Illiamna, and Redoubt, were all sending columns of steam, but they did not pourtray signs of warmth. Illiamna and Redoubt were particularly frigid. Great mantles of ice encased their giant slopes to within two thousand feet of the sea level. The Cook Inlet shores showed signs of an earlier season than did the coast from Sitka to Seward. Indeed, from Seward northward and to the utmost reaches of Cook Inlet the advanced stage of vegetation betrays the greater effect of the Japan current. The snow here had been melted several weeks, grass was thriving, the alders, willows, and birches were in new dress, and the overtime work of the sun in high latitude was everywhere in evidence.

Tyonok, a little row of log huts, dignified by more pretentious storehouses of the Alaska Commercial Company, was not sighted until we were within ten miles of the sand spit upon which it is located. Behind it we noted a bank perhaps four hundred feet high with curious lines upon it.

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Here we saw as we got nearer cultivated gardens, planted on steep slopes because at that angle the greatest heat would be absorbed. These gardens are said to be "planted with a shotgun, and dug out by landslides." Beyond this embankment there is a wide spread of timbered tableland which ends in the foothills of Mt. Spur, a snow peak nearly 11,000 feet high. The foothills and associated peaks of this mountain are so extensive that it would be safe to say that Mt. Spur has the largest base of any mountain in North America.

At 2 A.M. we dropped anchor in the rushing tidal current a half-mile off shore. Among the huts in Tyonok wolfish Eskimo dogs chased each other, sounding their harrowing howls. This, with the whistle of the *Santa Ana*, brought out a few half-clad, half-awake Indians. On board ship everything was life and bustle, men and horses after a long sea voyage had reached their destination; henceforth a keen battle was to be fought with the sterner elements of nature. All were bent on exploring, some for gold, some to find the haunts of new game, and others to climb America's giant peak. To the east, sharply silhouetted against the orange glow of dawn, we saw Kenai Peninsula, the curious line of ice-crested mountains of uniform height. To the west and south-west, under a dark purple sky, rose the rugged outline of the Alaska Peninsula. The most noticeable features of this sheen of cold, hard mountain expanse were the smoking volcanoes of Illiamna and Redoubt.

The icy mantle of Illiamna was glowing with the fire from the rising sun. Redoubt spouted flames and vapours and gave a suggestion of life and heat to what appeared to be a land of death and frost.

The shore-line of the head of Cook Inlet was screened by a blue haze, but several times during the night of twilight we got a peep of a snowy crest which pierced the blue dome far northward. This peak like a star on a cloudy night would blink and disappear with marvellous quickness. It did not seem to us as being very far away, nor did it give the impression of great altitude, but there was a mystery about the thing which kept one's attention pointed. This in reality was Mt. McKinley, one hundred and fifty miles away, the ultimate destination of the impatient adventurers on board the *Santa Ana*, the new Eldorado of the big game hunter, the gold seeker, and the mountaineer.

I found it interesting to try to note the reasons why men go to this far-off northland to fulfil the ambitions of the prospector, the hunter, or the mountaineer. The three classes have no interest in common, and no sympathy for each other; each argued that the other's longing should be satisfied nearer home; but the somewhat similar train of troubles in prospect for them made a kind of brotherly bond to help each other. We were all the wildest kind of dreamers.

Soon we began to throw the horses over to swim ashore, but the tide was so strong and

the water so cold that the poor creatures were nearly exhausted before they scented the shore. The long ocean voyage had prepared the animals doubly to appreciate the sense of security of land and its growth of luscious green grass. Their ears quivered, their heads raised, and their feet were light when green fields and new forests were once more before them.

We had now come five thousand miles only to find that the enormous task of getting to the base of the great mountain had but just begun. Thus far our voyage had been one of pleasing surprises greatly enjoyed by all, but now we had arrived at the parting of the ways, and also came the parting of friends. Mrs. Cook had accompanied us thus far and was eager to go farther, but in the anticipated hardships of the overland trip it did not seem to be prudent to risk the discomforts, so she wisely decided to limit her exploring ventures to the more congenial coast in the vicinity of Valdez. Captain Schage and several other friends bade us a hearty farewell, then the old steamer turned seaward and we were left to work out the task of transporting ourselves and supplies over regions of forests, marshes, and mountains to the heart of Alaska.

By this time I had gotten acquainted with the men of the party, and it was now clear to me that I had made no mistake in the selection of the personnel. At any rate the manly faithfulness of each was clear and while we must have personal

differences of opinion, as do the members of every pioneer expedition, the determined union of forces displayed on this first day of hard work was never broken.

CHAPTER II

FROM VOLCANIC FIRES TO FRIGID JUNGLE

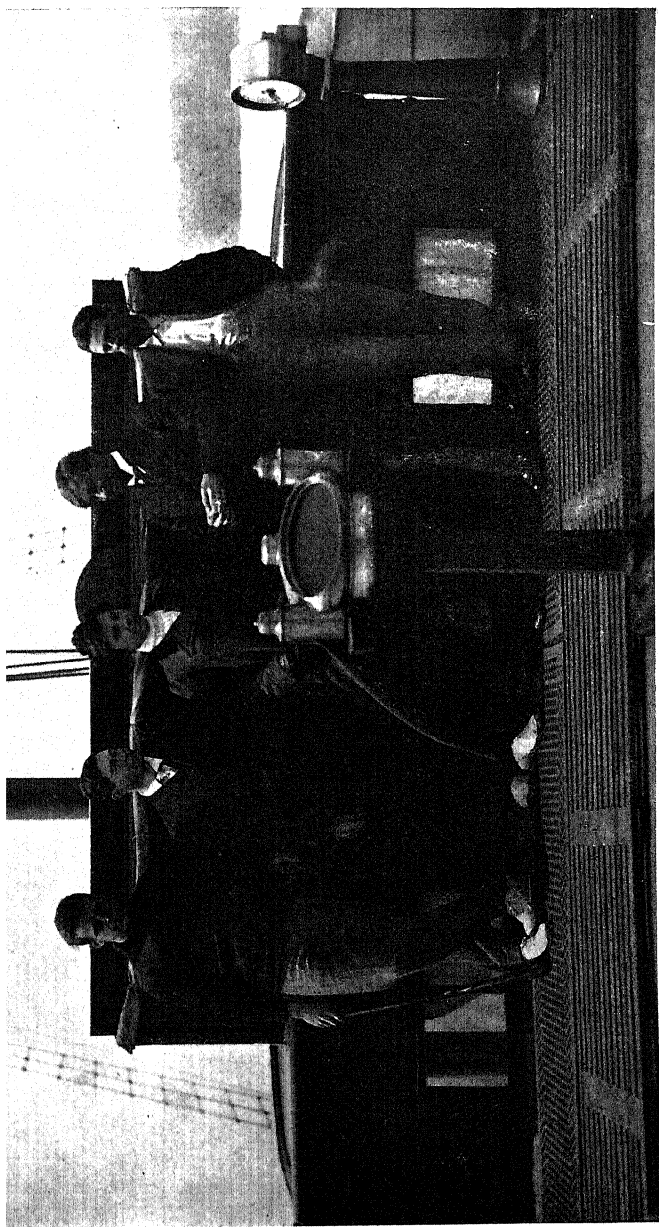
WE HAD quite an exciting adventure in training our semi-savage horses to submit to carrying packs. The long period en route by train and boat, being fed on oats and cooped up in small boxes, did not tend to a taming tendency. First the Indian dogs tormented them, and later the flies and mosquitoes sapped their blood, and now we were trying to harness the excited animals. They had about decided that this new land promised trouble and they resented with tooth and hoof. For two days we packed the cayuses and they unpacked themselves, kicking us and the packs around the old army barracks in lively Western style. Ronzo, the most wicked of the horse desperadoes, escaped so many times and made such dangerous plunges that we thought it prudent to give him his freedom. Finch, the energetic storekeeper of the Alaska Commercial Company, said that he would school him to a better life, but Ronzo's heels were too light and when we returned four months later he was still the hero of liberty, roaming at will in the forests toward the fires of Redoubt volcano.

Packed with one hundred and fifty pounds each the horses were started northward on the morning of June 25th along the beach of Cook Inlet. The animals were frisky and set a rapid pace. Soon after noon we reached the end of an extensive flat meadow which marked the beginning of the low country of the delta of the Beluga. Here we found in abundance the three necessities of camp life, grass, wood, and water, and soon decided to camp. On the following day we set a course through a jungle out of which the snow had just melted, to the first bank above the delta about five miles from the mouth. Here we saw a large brown bear on the opposite shore pitching salmon on the beach. The bear paid no attention to us, and since we were not in need of either his skin or his meat we did not interrupt his sport. Successive schools of white whales (belugas) ascended the river, cutting the oily, chocolate coloured surface of the waters in a vigorous but graceful manner and spouting jets of vapour with a sound that reverberated from shore to shore, breaking the silence of an otherwise desolate wilderness.

The Beluga River takes its name from these white whales ascending its waters. From the miners who have prospected its shores to the source we learned that the river is about thirty miles long and starts from two deep lakes. These lakes are supplied by glacial streams coming from the mountains to the north and east of Mt. Spur.

Great overhanging glaciers are above the last of these lakes and the frequent earthquakes shake down extensive masses of ice, which, falling into the lake, cause the river to rise with a dangerous suddenness. One of these strange floods occurred in winter when the temperature was 40° below zero, and all the river was covered with ice. Suddenly the ice and the flats were flooded and the miners who were sledding up the river barely escaped by climbing trees, for a flood at such a temperature makes a sweep of death to all living things.

The Beluga is very shallow at its mouth but at high tide moderate-sized boats with a draft of not more than four feet can cross the delta. Above the stream deepens and narrows to about four hundred feet. It is navigable for about ten miles and with dories much farther. This would make a splendid area for a small exploring party. Bears are very numerous and the chances for other game are good. The opportunities for original discovery are not surpassed by many other regions. Placer gold, copper, and coal exist here, in tempting quantities. The river winds through a densely forested low country where botanical enthusiasts and collectors of small life are likely to make many discoveries. In the lakes should be found rare specimens and in the mountains above there are new unmapped snow peaks and glaciers enough to satisfy the most ardent alpine climber.



Robert Dunn

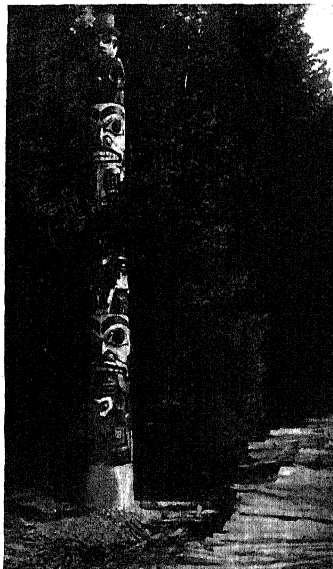
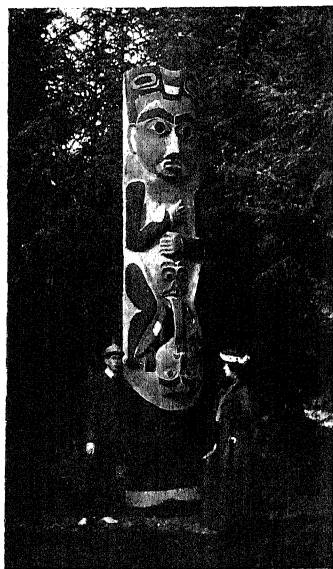
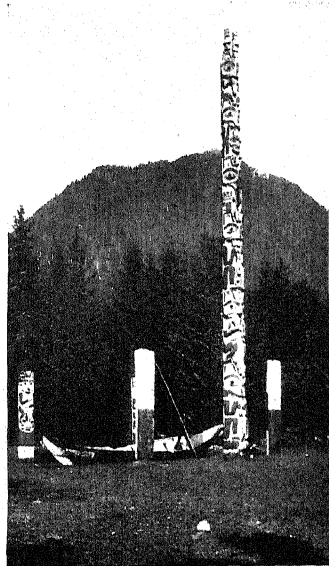
Ralph Shainwald

Mrs. F. A. Cook

Dr. F. A. Cook

Fred Printz

THE PARTY OF 1903



TOTEM POLES, SITKA

From Tyonok a boat was sent to the Beluga to ferry the men and the packs. This task about completed we took the lead horse, fastened to him a long rope, urged him into the river, and paddled slowly across stream, while the other horses were forced to plunge in from a cut bank. They gathered in a bunch, snorting, and tried to get back to the shore from which they started. Failing in this they took to the stream for the green meadows opposite where the lead horse was towed as a decoy. They climbed out on the soft marshes and here they saw many fresh bear tracks which interested them very much. With their noses to the footprints they started in a hasty pursuit like dogs on the chase.

The route which we had outlined to the western slopes of Mt. McKinley was one explored and advocated by Alfred H. Brooks of the U. S. Geological Survey. From the Beluga there was an old Indian winter trail close to the head waters of the Theodora River over bald hills to the head waters of the Talushulitna River, and from thence keeping a general north-western course to the head waters of Canyon Creek, following this creek to the Skwentna River. Descending the Skwentna to a point about a mile below the lower canyon and crossing here the trail wound around the shell hills over an old trail cut by Lieutenant Heron. We aimed to cross the range through Simpson Pass into the Kuskokwim and from there, above the tree line and close to the

Alaska Range we expected to find a trail to Mt. McKinley.

Under the direction of Dunn the pack train was started over the Indian trail for the Skwentna. I estimated that it would take about seven days to cover this sixty miles of very difficult traveling through dense forests over marshes and tundras. We anticipated considerable difficulty in getting a boat to the Skwentna ford in time to ferry the packs across without delay. Though I should have preferred to join the pack train the uncertainties of the boat mission were so great that I assumed the responsibilities of that campaign with Miller as my associate. In our small dory loaded to the gunwale we drifted quickly along the cut banks of the Beluga in oily brown waters, out through the delta with its great stir of bird life into the rushing tide ripples of Cook Inlet. We thought we had gauged the tide time rightly, for in the Inlet tide not time rules every movement by land or sea. Ashore progress is only possible along the sandy beach at low tide; by water, since the tidal current is eight miles per hour, everything goes with it. We aimed to strike the tide high and so go over the great flats into the delta of the Susitna River. The river is about five miles wide at its mouth with but two or three navigable channels very difficult to find. While searching for these channels the tide suddenly went out and left us high on a vast mud flat. In a few minutes we found our boat glued to a pasty

clay a mile from shore and three miles from the receding tide waters. This was exactly what we had tried to avoid, for we knew that the rising tide was likely to come with the wild sweep of a destructive boa, filling our boat before she could rise from the sticky clay.

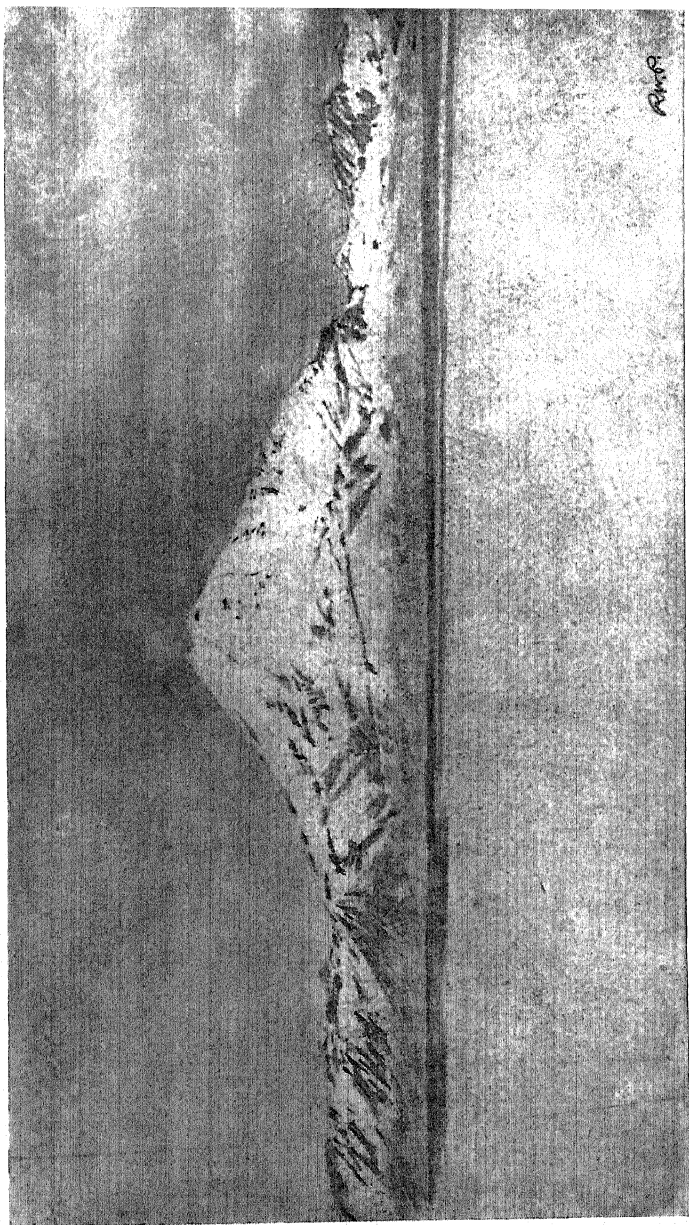
The ensuing night caused us a great deal of anxiety. Our first concern was to devise some plan to raise the boat on planks so the coming tide would not find us pasted to the clay. This was soon accomplished and then we sought some wood for a camp-fire. A good portion of the night was spent in brewing tea, cooking beans, and baking bread while we watched carefully the weather signs. For an incoming wind with the tide would mean destruction to us. We took turns in keeping up the watch for the coming danger.

This night with its run of uncomfortable premonitions was nevertheless strikingly impressive. The sun sank under the rugged snowy peaks of the Tordrillo Range, leaving a warm rosy afterglow over everything. Even the mud which, ordinarily black and repulsive, covered our surroundings glittered with reflected colours. Redoubt volcano, eighty-five miles south, in a cloak of violet snow, belched huge tongues of fire and clouds of vapour. One hundred and twenty miles south, still plainly visible, was Mt. Illiamna, clear cut, its cone of bright purple snow standing against a sky of dark purple-blue. Then as the eye glanced across the great expanse of rushing

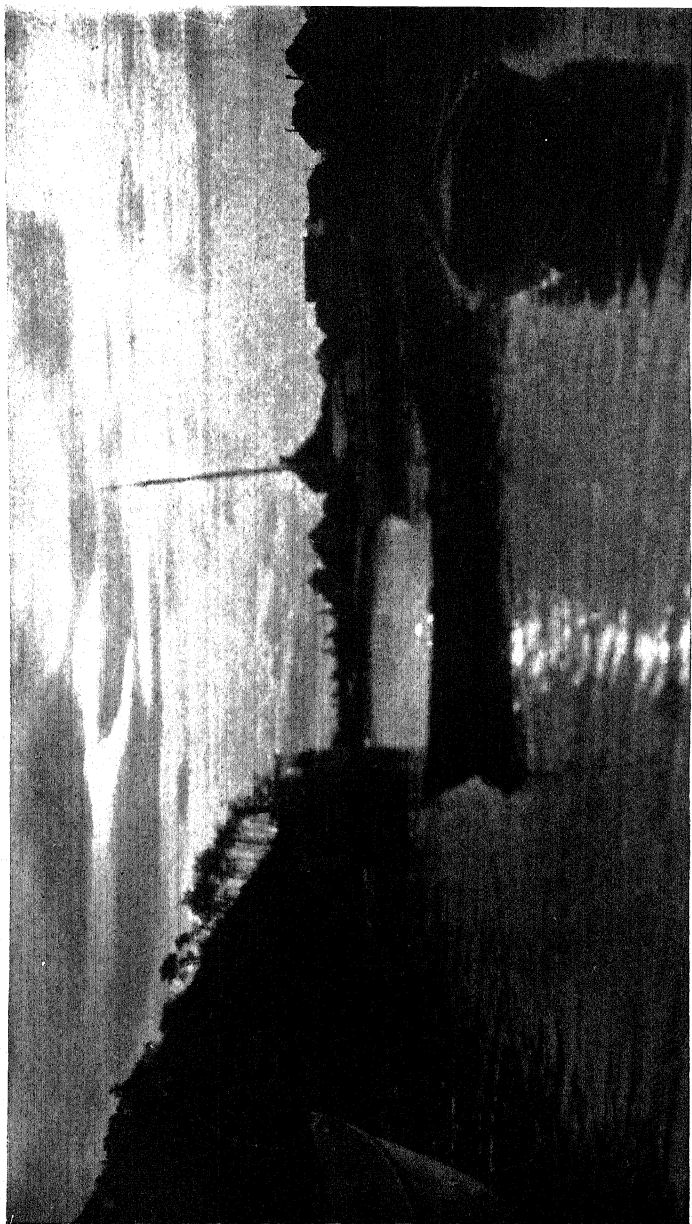
waters of Cook Inlet it rested upon a sea of fascinating blues and purples and violets, flooded by the rose and gold of the parting sun. Far off to the west, under a haze of blue, were the curious mountains of equal height, characteristic of the Kenai Peninsula. To the north Mt. Susitna, dull, black, and gloomy, wrapped in storm clouds, apparently but a stone's throw though fifteen miles away, and to the eastward of it the great broad delta of the Susitna River, covered by a dense verdure, almost tropical in luxuriance. It was a scene which rapidly changed in colour and interest as the long twilight of the arctic midsummer night advanced.

In the morning the tide came and lifted us as easily as it had left us, and then we pulled for the left fork of the Susitna River. We soon found that the current of the river was too strong for rowing, so we tried towing. At noon we came to a small Indian settlement, where we got an Indian boy by the name of Stephen to assist us. Stephen proved to be an expert boatman, but our troubles increased with every mile of advance. The water got swifter and deeper, too swift to paddle and too deep to pole, while the cut banks and overhanging brush made lining almost impossible.

On the morning of July 2d, after nearly four days of the hardest kind of river boating, we reached Susitna Station, a small trading post twenty miles up the river. The weather had been uniformly bad, cold and wet, but it did not prevent



REDOUBT VOLCANO, COOK INLET



TYONOK

the gnats and mosquitoes from doing their worst. These persistent pests followed us over the waters in clouds, with a buzz that drove us to the verge of madness. Our hands and faces were so badly bitten that we developed serious forms of inflammation, followed by pain, fever, and torture indescribable. All this in spite of great care in protecting ourselves by "dope," veils, gloves, and a mosquito-proof tent. I have seen mosquitoes and allied pests in all parts of the world, but the Susitna denizens are certainly in my experience by far the most desperate in their attack upon man and beast.

At the Station we secured Evan, an Indian friend of Stephen, to assist us; we also obtained a better river boat. We had arranged to meet the pack train at a point fifteen miles up the Skwentna River in a week after leaving the Beluga. We had spent five days in ascending the Susitna twenty miles, and now there were sixty miles of worse water ahead of us before we could join our party. Our Indians told us that it would take twenty days to meet the horses.

Soon after leaving the Station we pulled up the Yentna River, a great glacial stream a half-mile wide draining most of the eastern side of the Alaska Range.

Poling and towing, rowing, pushing, and by all kinds of devices, we averaged twelve miles daily. The fifteen miles up the Skwentna River to the canyon, which we were told could not be made in

less than a week, was covered in one long day. On the morning of the 8th of July, we pitched camp on a small island in the Skwentna River, two miles below the canyon, the appointed place to meet the pack train. Nothing was observed of our companions, though we expected them to have been in waiting several days, till noon of the same day, when we heard a voice and soon we saw the horses moving along the southern side of the river. The Skwentna is here about three hundred yards wide, and plunges over a gravel bed at the rate of eight miles per hour. The men and outfit were quickly ferried over, but we had considerable trouble in swimming the horses. One unfortunate animal was carried down-stream five miles, and was only finally secured by the great skill and diligence of Printz; but the animal was so nearly exhausted that it never recovered its normal strength, although it followed us to Mt. McKinley.

The course taken by the pack-train from the Skwentna River was almost due north twenty miles over swampy spruce-timbered country to the Kichatna River about four miles above its mouth, and to this point it was also necessary to take the boat.

CHAPTER III

WESTWARD THROUGH THE ALASKA RANGE INTO THE KUSKOKWIM

THE descent of the Skwentna River was immensely exciting. In less than two hours we rushed over fifteen miles of foaming rapids, jumping boulders and snags and gravel bars with a rush that made us hold our breaths. In ascending the Yentna we discovered that the river in the vicinity of Mt. Yenlo split into several slews making large picturesque islands. To study this curious distribution of river waters and the edge of the Alaska Range through which we were about to seek a pass we ascended Mt. Yenlo or *Tahliktoh* as the Susitna Indians call the mountain. It was also expected that from here we would be able to get a good view of Mt. McKinley and its environments from the south and east.

We landed on the east side of the Yentna at a point where the main river is nearest the southwest base of the mountain. After making camp under birch trees we left Evan to guard the boat from floating driftwood and our food from bears, while Miller and Stephen joined me in the first alpine

adventure. A broad marshy meadow was first crossed. Here we sank to our knees in pools while the brush and high grass made progress difficult and slow. In the centre of this marsh we found a chain of small lakes in which we saw salmon trout darting about. On the surface of these lakes we were surprised to find pond lilies and along the edge were beautiful yellow and purple flowers. The soft green verdure and the warm colours of the mountain were superbly reflected in the mercurial surface of the water, but in our comforts we were not in harmony with the deceptive congeniality. The water was just above the freezing point, we were saturated to the skin by the wet grass, and in sinking waist deep into pools we had become coated with mud. Mosquitoes in clouds were settling upon us, and the normal chill of the frigid jungle was approaching with the setting sun.

In trying to pick the most promising ground we noticed that a grizzly had been through there on a similar mission. We followed his footprints and soon discovered that his course was good enough for us. We argued that this bear was probably aiming for the blueberries above tree line, or the ground rats at the top of Mt. Yenlo, and after eating bacon and beans, as we had for two weeks, we were ready to accept bear diet or even bear steaks as a delightful change.

Miller and Stephen, with their guns always ready,

turned their eyes expectantly from side to side, but they saw only the fool-hens. Bruin had good sense; he knew where the ground was best, and, better still, he led us to the only place where the lakes could be crossed. As we reached the base of the mountain the trail was lost and then we picked a course through a dense forest to an elevation of two thousand eight hundred feet; five hundred feet more were made through grass five feet high, and there on an old glacial shelf we pitched camp at midnight.

Early on the morning of July 12th, we tumbled out of our silk tent, and with a few roots we made a fire over which we melted some snow for a cup of tea, and then, over steep grassy slopes, we made the final ascent to the top. From here we had a most magnificent view of the easterly slope of the Alaska Range, and of the vast expanse of fertile lowlands. It was a view of the least known but probably the most picturesque area of Alaska.

Mt. Yenlo rises out of a wide expanse of low marshy country. The mountain is a narrow ridge running north and south with several peaks, the highest point being the most northern one, about five thousand feet. Our position was near the centre at an elevation of four thousand two hundred feet.

The top of the mountain was covered with short grass and some moss. The blueberries just under the crest of the mountain were not yet

ripe. Here and there were banks of winter snow still resting in sunless places. Hundreds of ground rats were darting about, and when there was no wind we were tortured greatly with mosquitoes.

The grizzly had preceded us and dug out many ground rats and our Indian boy followed his haunts with visions of bear steaks. The mosquitoes were so troublesome that we found it difficult to manipulate our instruments, but soon there came a breeze out of the long blue waters of Cook Inlet which swept the little pests from our immediate neighbourhood. Taking advantage of this little puff of air we set our cameras, levelled our theodolite, and arranged the other instruments for a round of observations. These observations when worked out did not alter the essential features of the remarkable map made by Brooks and Reaburn, but we were able to fill in several blank spots.

We now saw that the Yentna River which we had ascended divided its waters between the Skwentna and the Kichatna around three large islands. These islands and indeed all of the lowlands looked like carefully cultured parks. There were belts of high spruce, birch, and cottonwood trees along the water and inside of this dark green belt, usually but a few hundred feet wide, was a level area beautifully covered with a profuse growth of light-green grass. Circles of alders and willows and small lakes covered with pond lilies

made the park-like picture complete. No city park could give a more beautiful and carefully planned artistic effect than this impenetrable wilderness to the east and west of Mount Yenlo. Our position was high and far enough away to prevent a critical view, for in reality no tropical jungles could be more dense than the chaos of underbrush in the narrow belt of forest. The beautiful light-green meadows were marshes over which man or beast could only travel with the greatest difficulty. Later we learned to our hearts' content that this enticing landscape so beautiful to look upon offered us the tortures of countless devils—mosquitoes, horseflies, gnats, and marshes, thick underbrush, icy streams, and never-ceasing rains all combined to make life thoroughly miserable for us. In this misery we lost our earlier enthusiasm for the birdseye view from Mount Yenlo.

Our admiration of the great Bolshoy group, which as seen from that point is surely the most remarkable range in North America, was heightened from every other point of observation, though we did not again get so comprehensive a view. Sixty miles northward Mt. Foraker, a double ridge, acted as a barrier to the westerly drift of clouds. A little to the eastward, seventy-five miles away, was Mt. McKinley, a huge beehive loaded down with prodigious quantities of snow. East of Mt. McKinley we saw a group of mountains from five thousand to ten thousand feet

high, separated by deep narrow gorges. Mt. Russell is a sharp ice-sheeted pyramid piercing the sky about seventeen miles south-west of Mt. Foraker. About twenty miles below appeared Mt. Dall, also a pyramid, mostly free of snow, with the rock strata clearly marked though forty miles away.

Midway between Mt. Dall and Mt. Russell we noticed a cluster of sharp peaks east of the main range with an average height of about eight thousand feet. These I have named Bryant Peaks in honour of my friend and co-worker, Mr. Henry G. Bryant, Secretary of the Alpine Club.

The Yentna takes its head waters from the glaciers in the vicinity of Mt. Dall, Mt. Russell, and Bryant Peaks. In the rolling foothills south-east of Mt. McKinley we noticed a depression which we afterwards learned was the bed of a large glacial stream, which flowing easterly and joining the streams from Ruth glacier empties into the Chulitna River above the lower canyon. This uncharted river is called by the Indians *Tokositna*.

The origin of the Skwentna River was easily seen from Mt. Yenlo. Out of the high icy mountains west of Alger Peak and north of Mt. Estelle the waters descended; uniting with those of the opposite side they pour into a canyon; but a few miles below, the waters rush out and spread over a wide flat, narrowing again to a second

canyon below. The Skwentna is about eighty miles long and three hundred feet wide near its mouth, and is navigable with dories for about forty miles. The last fifteen miles of the stream flows through a low country to the Yentna. There is placer gold and lignite coal found along this river.

The Kichatna, taking its first milky waters from Fleishmann and Caldwell glaciers, takes a course nearly parallel to that of the Skwentna, through a deep gorge, and pours over a succession of rapids almost its entire course, emptying into the Yentna opposite Mt. Yenlo. The river is about fifty miles long and about one hundred and fifty feet wide near its mouth; navigable with dories for only about ten miles. Gold is found at a point just beyond navigation. Up the valley of the Kichatna we saw continuous streams of great, fluffy, cumulus and nimbus clouds drifting through the range to the arctic slopes beyond. To follow these clouds with our dreams of mountaineering conquests is the next adventure.

At breakfast we ate our last food. We expected to get to the river for lunch, but it took us nearly all day to get to the section of the mountain necessary for our observations. At lunch Stephen got for us some ground rats, saying they were good for white men but not for Indians. We tried roasting them on a stick, and while we were not enthusiastic as to their palatableness, we agreed that rats were not bad. We descended in about

two hours and found Evan haunted by all kinds of spirits—saying it was no good for an Indian to be left alone.

We ascended the Kichatna River late that night, July 13th, so late that it proved too dark to find a camping place. It was a welcome sound when at eleven o'clock we heard voices and saw the camp-fire of our companions on the south bank of the river, in a swamp among spruce trees. On the following morning we crossed the stream, and found a better camping ground. Dunn reported much difficulty in crossing the low, wet country. The horses were frequently mired, and both men and horses showed signs of a hard time. After a day's rest the horses were started with light packs up-stream along the soft ground of the banks and over many slews to the first high ground. The boat, with an increased load, followed. Our camp on the evening of the 15th was on a foothill about ten miles from the mouth of the river. From here our Indians were sent back. They were good faithful helpers, and we would gladly have taken them farther, but they were eager to return to their fishing grounds, and we could not have carried food enough for them had they continued with us.

Our route now lay westerly along the Kichatna and this in many respects proved to be our most difficult trail. Continued rains, thick underbrush, rapid streams, and difficult slopes, as well as horse-flies and mosquitoes, all combined to retard pro-

gress. Our horses soon failed in strength and were so sick that we could march them only three hours every second day. Their legs were very much bruised and lacerated by the brush, their skins so badly bitten by horse-flies and mosquitoes that they developed a kind of blood poisoning. Our packer called the disease distemper, but I am inclined to ascribe the entire trouble to direct poisoning through open wounds. A somewhat similar affection is commonly known among the Indians and prospectors who are much bitten.

The scenery up the Kichatna was usually hidden from us by the dense forests and thick clouds which drifted into the pass. Occasionally we got a glimpse of rounded mountains, three thousand to four thousand feet high. To the south we observed frequently high picturesque peaks in unexplored areas. We longed to investigate this region, but our main object compelled us to press onward. As we rose out of the Kichatna we got a glimpse of the first remarkable scenery at close range—to the north, a great brown tongue of ice, Caldwell Glacier, nearly two miles wide, with arms reaching to unknown heights between steep, snowy slopes. The water which comes over, under, and through this glacier with a mad rush gives origin to the Kichatna River. Before us was the broad, green depression, with black, cloud-crested, slaty peaks to both sides, six thousand feet high. This valley leads to several passes through the Alaska

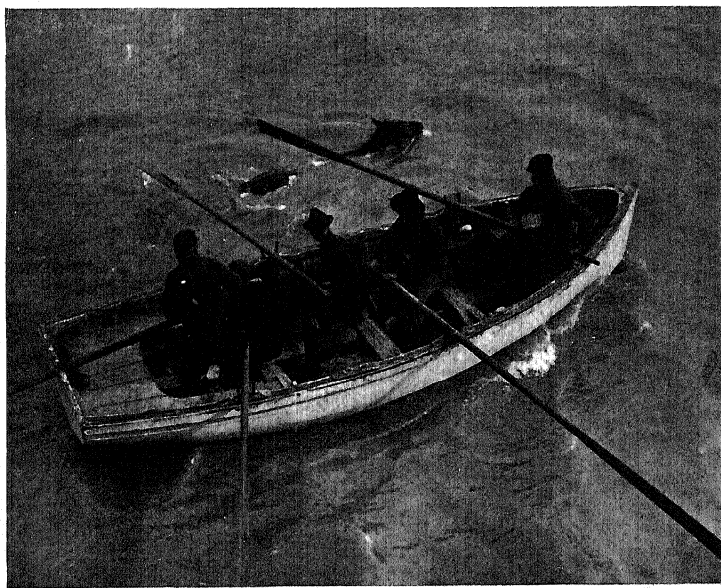
Range—one to the south, which Brooks discovered; another westerly named by Lieutenant Heron, Simpson Pass; and there is probably still another between the two. Before entering Simpson Pass, we crossed a milky stream, which came from a cavern leading to Fleishmann Glacier. This glacier in size and surroundings is similar to Caldwell and its drainage joins the same river.

It had rained almost incessantly from the time we left Tyonok. The men were always soaked to their skins, their boots were continually filled with ice-water, and the horses were wet and bleeding from wounds, but in spite of all this we slowly pushed our pack train up the Kichatna into the divide which had been crossed by Heron and Brooks, camping among the cottonwood trees near the head waters of the Kichatna.

In the pouring rain, on July 27th, we started the pack train up the steep treeless slopes over which the clouds pressed through the range. It was an old gathering basin, part of a huge ice system which once filled the valley of the Kichatna. Blueberries were very abundant and so were signs of bears. We saw one as we got well into the mountains, and we quickly had visions of bear steaks; but the bear also saw us, and betook himself out of range. Moose, caribou, and sheep tracks were abundant. The tracks of Heron's pack train where it crossed here five years previously were



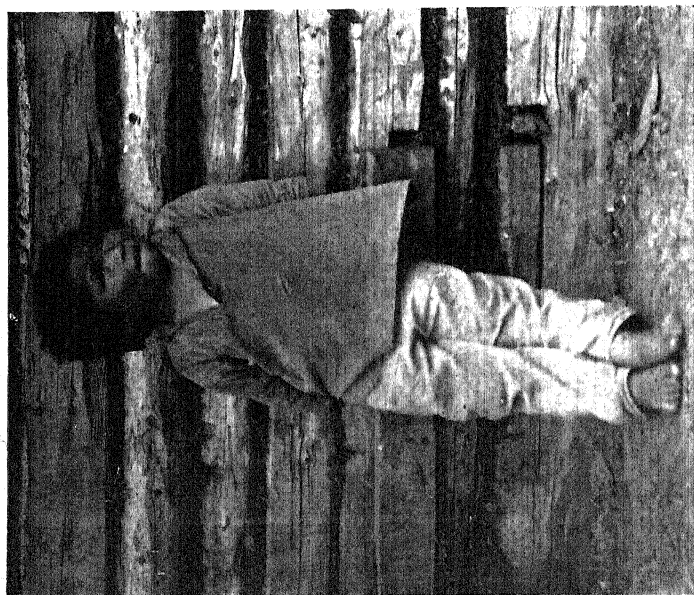
INTO THE CHULITNA CANYONS



GUIDING A HORSE ASHORE, COOK INLET
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THE SUSITNA CHIEF



A KENAI WAIF

still visible and also those of Brooks's horses. We camped at an altitude of about four thousand feet along the northern side of the valley one mile east of Fleishmann Glacier. It was a miserable camp with rain and snow being driven by violent gusts of wind, and with only small green willows to burn, but the pass which we aimed to follow had as yet not been located and we did not care to travel through the frosty mists to the dangerous cliffs and overhanging glaciers as we broke through the range.

During the brief periods of clearing we saw gaps through the range and the deep blue of the Kuskokwim skies beyond. To the southward was Brooks's Rainy Pass, but we wanted a more northerly route. To the northward there was a promising gorge but this proved to be a blind pass leading to a kind of ice-cap. In our scouting about we saw a gap north of Brooks Pass which offered a workable route but in seeking Heron's trail we went close to the face of Fleishmann Glacier, and from there was noted a deep cut choked with clouds. We explored this and found it to be Simpson Pass for which we had been looking. With this happy news we returned to our shivering colleagues at camp and ate an extra ration of bacon and beans to celebrate our luck.

Very early on the following morning we gathered the horses, who seemed to enjoy the frosty air because of the freedom from mosquitoes, and

packed for the plunge into the Kuskokwim. We crossed a huge ice bridge and turned sharply to the west over a grassy meadow marking the divide, into a little stream. This stream was hardly more than a leaping jet of spring water, but its volume increased quickly. Soon we descended to alders and willows of moderate size, and there the stream had grown to a vigorous brook and plunged into a desperate looking canyon. We sought a trail over the walls above the canyon and crossed from side to side as required by the slopes. The splendid spruce forests of the Kuskokwim were seen soon after crossing the divide, and to get to these was our day's mission, but the distance was deceptive; men and horses tumbled down slopes all that day—until almost too tired to move their feet. The march was continued for fifteen hours without stopping to eat lunch. Late at night as the sun was gliding northward we stumbled into the broad expanse of the Rohn River. It was a deep and swift glacial stream, but just beyond were big green trees and on the steep grassy slopes above hundreds of white mountain sheep were seen grazing in groups. The possibility of juicy sheep meat made us forget all the discomforts of the day.

Our camp here was better in its anticipation than in its realisation. After various kinds of gun luck we had but one old Winchester in working order, and it did not shoot straight at long range. The sheep were wise enough to be watchful and

no meat was secured, but it was satisfactory in a way just to see them wander at long range, over snow-streaked mountains. Moose and bear tracks were abundant but we were too hard pressed for time to do much hunting. In the low country fool-hens, ptarmigan, rabbits, and squirrels were abundant. Food for the horses was very scarce in this region near the Kuskokwim and the horses in consequence greatly failed in strength. There was, however, one great redeeming feature in the life west of the range—this was the entire absence of horseflies and mosquitoes.

Two days' march brought us to the Kuskokwim River, among mountains six thousand feet high, appropriately named, because of their colour, Terra Cotta Mountains. Here our lot was unfortunate. The horses again failed because of the scarcity of grass, and worse still, John Carroll, who had been ailing for some time, found that he could no longer keep up with the pack train, and returned, taking with him one horse to carry his provisions. Our party now consisted of five men and thirteen horses; the horses each carrying about one hundred pounds.

Just ahead of us at this time was Egypt Mountain, a pyramid of red sandstone; a little farther north, Farewell Mountain; and beyond the great green expanse the spruce covered valley of the Kuskokwim. Soon after passing Egypt we bid farewell to the Kuskokwim, and set a course above the tree line north-easterly along the northern slope of

the Alaska Range. Here the grass improved; blueberries and game were abundant. Horses and men were well fed, and accordingly rapid progress was made.

CHAPTER IV

THROUGH THE WORLD'S BEST BIG GAME COUNTRY

WE NOW entered Nimrod's dreamland. To the west were ten thousand square miles of unexplored territory. We made no attempt to press into this, but from our various high points of outlook we could see that it was a low, rolling, spruce-covered country. We noted that the south fork of the Kuskokwim drains the western side of the Alaska Range, as does the Yentna from the east. Its waters, however, descend into the great sluggish volume of the lower river and reach the Bering Sea, by a broad, dangerous delta.

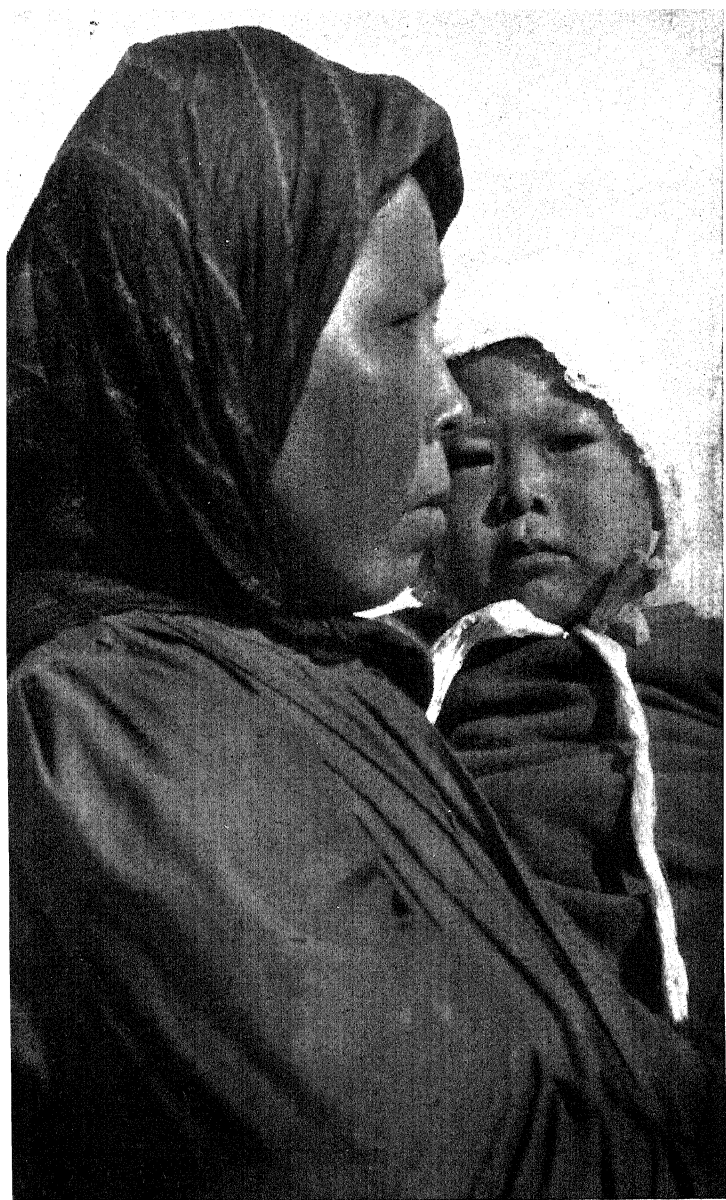
Our route was along the edge of this timber, north-easterly parallel to the Alaska Range for several hundred miles. To the east there was a surprise at every turn. Range after range of rounded foothills rose to beautiful snowy crests. Great gorges and canyons with rushing milky streams led to the tongues of unnamed glaciers. Below a sub-arctic forest of mystery with its unknown small life and fur-clad animals; above the paradise of the bear, moose, caribou, and sheep.

We had now, in spite of various trials and difficulties, gone about one half of the distance to Mt.

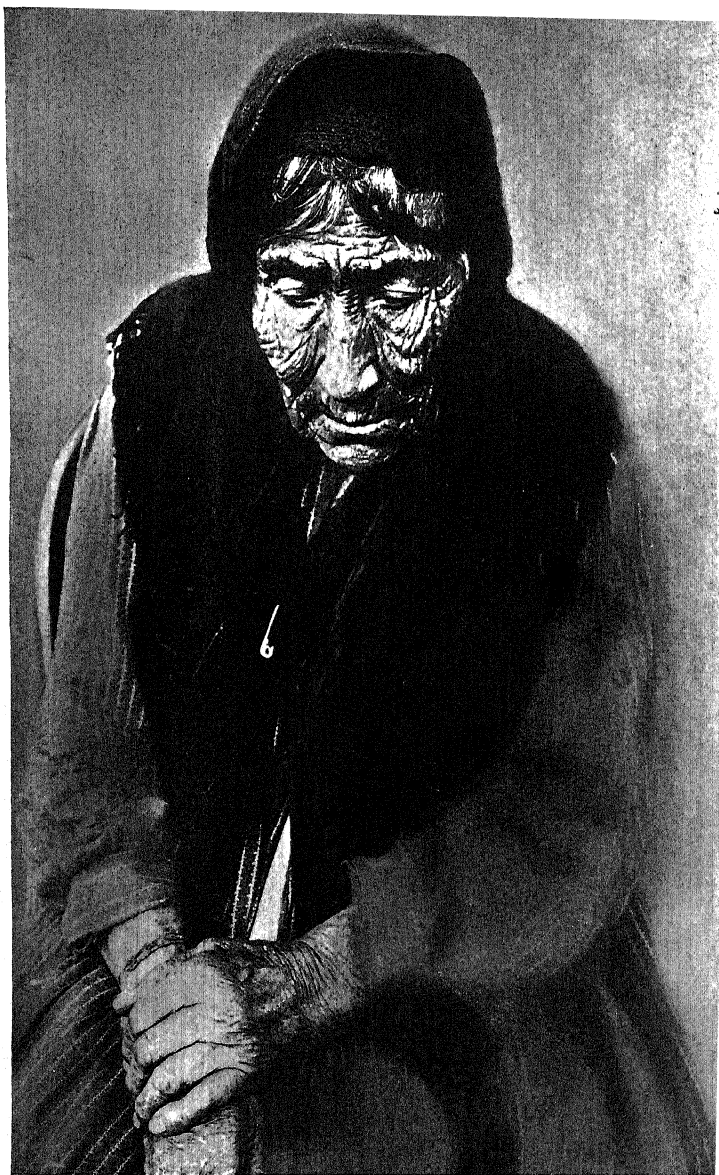
McKinley. In an air line this distance would probably be one hundred and fifty miles, but in reality we had covered more than three hundred and fifty miles over the worst kind of trail imaginable. Our outfit had been wet constantly and our food was beginning to show the effects of the bad weather and bad treatment. To the present we had secured very little game. Birds and fish, it is true, were abundant, but as a rule we had not the time to hunt or fish. Our hopes, however, were good, for now we were about to enter a region where the signs of large game were such that we must stumble over fresh meat.

We turned our backs to the Kuskokwim, with its famine of grass, to the great evergreen expanse beyond Egypt and Farewell mountains on the morning of August 2d. An icy wind followed us, but we soon entered a dense forest. At noon we broke through thick brush and came out upon the wide flats of Jones River. Here we found some grass, and though we had made but a short march our horses were too hungry to travel farther. This camp was particularly agreeable to both men and horses. The animals had their first good feed for several days, and with an abundance of blueberries and partridges we too had a good dinner. In exploring above camp we saw game signs everywhere, but as yet nothing big had gotten in range of our inefficient gun.

Rising higher and closer to the range we crossed several dry, barren ridges, and descended to the



SUSITNA MOTHER AND CHILD



THE IMPRINT OF A HARD LIFE
A Kenai squaw said to be more than 100 years old

southern fork of the Dillinger River. Here we secured a young brown bear, and gloried in bear steaks, bacon and beans, and delicious brown biscuits baked in the reflector. As the sun sank into the burning gold of the Bering Sea that night we were tired but enthusiastic as to the outcome of our undertaking.

A quantity of bear meat was packed as we started on the crisp morning of August 5th. The weather since crossing the range was much better than along the eastern side of the mountains, though a few clouds were still pressing from the east through narrow gaps between snow peaks, and these poured brief but severe rain showers over us. The temperature was usually about 50° and the humidity increased rapidly as we went northward. We were now above brush; the ground was hard but the land became more and more irregular as we pressed towards the Tonzona River. Steep climbs and disheartening descents were necessary to keep to a good general north-easterly course.

From the Jones River to the Dillinger River we crossed a very irregular country over the depressions of low rolling foothills into marshy gullies. As we neared the Dillinger we passed through a beautiful green expanse, spotted by many small clear lakes, and here our scent for game became keener than ever. Many reported sights of moose proved to be illusions, but game trails crossed everywhere, and finally as the pack train rose

over a mountain Printz hurriedly came back to the lead horse for the rifle and, while men and horses remained motionless, then advanced behind a row of rocks. There were four or five shots in rapid succession and then rising to spot the luck we saw that a big brown bear had fallen and we thought him dead, yet when Printz advanced knife in hand to get his skin the bear quickly picked himself up and vanished in the brush where we dared not follow.

Our camp that night was on an elevated bench above the lakes. Having made a long march we were too tired to do much hunting, but we watched the shores of the blue lakes with a hungry interest. The howl of the wolf, the bark of the foxes, and the giggle of the fool-hens and ptarmigans made the night air ring with weird noises which the horses did not relish. Our route during the next day took us over fresh moose trails which had been trampled to the depth of two feet below the level. We had lunch in a big patch of blueberries at the side of a river somewhat larger than Jones River. The stream rises out of a great gap through the range which seemed to be a pass for the moose and caribou to the east. Taking the drainage of the many small lakes it flows westerly, emptying into the Kuskokwim about one mile north of the mouth of Jones River.

Rising out of the Dillinger we saw several caribou and tried them with our rifles, but they only shook their heads and ran gracefully into the upper

valleys. Later on, however, while crossing a nameless stream beyond the Dillinger, we saw a pair of horns winding among the big boulders upstream and making an air line for our pack train. No one would take the gun for they had all tried and failed. Printz insisted that I try a shot; I did so, dropped the animal and thereby established confidence in the old Winchester, and incidentally my own reputation as a marksman was made. During the rest of the trip, with new confidence in the gun, our larder was kept supplied, but I did not again risk my reputation as a shot.

Over mountains ever higher, and slopes continuously more difficult, we pressed on for the Tonzona River. The weather was clear and warm and game was in evidence on every side, but now we secured it with such ease that the pack train was seldom interrupted in its march. Above us were long lines of white sheep moving in sunny patches of new green grass, below herds of caribou moving up the banks of small streams for the new grass in the uplands.

Late in the afternoon of August 8th, we rose to a saddle at an altitude of about five thousand feet and from this place we saw for the first time, from the west, the distinctive peaks of the main range. Mounts Russell and Dall were easily recognised from the score of lesser peaks. To the south of Mt. Dall we noted several wide gaps out of which pour the head waters of the Dillinger and the Tonzona rivers. Clouds drifted through these

gaps as they did through Simpson Pass and Brooks Pass. There seemed to be signs of good passes from the Tonzona to the Yentna.

As the sun poured its parting rays on the shining spires of Mt. Russell we rose to a dome-shaped mountain and beyond saw for the first time the broad expanse of the gravel bars of the Tonzona. The great low cuts through the mountains, making a canal for the clouds from the east, were now seen to better advantage. Beyond the Tonzona was an easy rise to a table-land and along the edge of this were huge boulders giving the impression of the houses of a big city. This table-land was the shelf of an old glacier which extends to and beyond Mt. McKinley. We descended very quickly along a steep slope winding around cliffs into a small stream which led us into the big cottonwood and spruce forests, to the side of the Tonzona. From this camp we saw our first moose. It crossed the stream near camp and rising to a green hummock within a few hundred yards above us from there looked down upon the stir of horses and men with evident curiosity. We did not need meat and could not carry his great spread of horns as a specimen, and therefore the animal was not molested.

East of the range the camp life was a torture. Continual rains, hungry mosquitoes, dense wet brush, and frequent icy fords made our daily adventures so difficult that we had neither the time nor the disposition to dwell on the few pleasant

phases of the boundless wilderness through which we forced a trail. But along the northern foothills all this changed. The weather was good, the mosquitoes were absent, the whole aspect of life was better, and with all this was the happy environment of a new world of big, wild animals roaming about undisturbed by man.

In this northland, where dusk and dawn run together, men get into the real swing of nature and close to each other's hearts at the camp-fire. There is something about the crackle of the fire, the inspiration of the blaze, and the long frosty nights of twilight, which bares the breast of each camper to the scrutiny of his companions. At the club a man may be a good fellow superficially, with the veneer of a make-believe spirit of human brotherhood over a selfish centre of commonplace discord, but in the sub-arctic wilderness this is impossible. Naked manliness under togs that are stripped and dried at the evening round-up with the aroma of the spruce and the music of the forest wilds, is the ultimate necessity of every adept.

If a man has been an artist, with system and order in the daily routine of his home life, he is sure to get a large measure of admiration from his comrades, for he gathers and disseminates bits of light that dispel the fatigue of the hard day's trail; but the haphazard chap who has run the life of a literary hack bewails his misfortunes, makes copy, secretes his observations of interesting things, and makes life tiresome by his egotism. As a discloser

of manly character the camp-fire surpasses the confession booth.

On the morning of August 9th, we packed the decreasing loads on the horses and cut trail through a wide belt of large trees. The Tonzona was here divided into a number of rushing streams. For each crossing it was necessary to mount the horses, and we had become quite expert at this kind of fording. All our things were packed in waterproof bags, and when about to ford we would make a running jump, alighting behind the packs. If the prospective ford proved a swim, as was often the case, we held to the pack ropes as best we could. In crossing the coffee-coloured waters of the Tonzona two streams were found to be very deep, and at one of these, after losing considerable time seeking a place to ford, we at last plunged in for a swim. Men and horses were carried down-stream a long way. Two animals turned over in midstream and their riders struck out for the shore, leaving the horses to follow. It was a warm, sunny day, but this swim in glacial waters made us feel like travellers en route to the Pole.

With garments soaked to our skins and with shoes full of water we continued the march. There was not time to change, nor had we the extra clothing, for these fords were so frequent that being wet was by this time regarded as a part of the game of getting to Mt. McKinley. Indeed we had adapted ourselves to this semi-aquatic system of travelling. We wore no hats, only very light

clothing, and short shoe packs. After a swim we shook ourselves and hurried along to warm up and dry out by the increased action of the march. Men will get used to this kind of life after awhile and enjoy it, but in the schooling one hears a great deal of sulphurous language.

Climbing out of the Tonzona we rose about two thousand feet over the edge of an old moraine among giant boulders. Here were extensive patches of large, delicious blueberries and also bright green spots of new grass. Men and horses with equal zest bent to the fruits of the soil. After half an hour the horses were rounded up and with grunts of mingled satisfaction and protest the ascent was continued to the great treeless plain above. On this grassy expanse, looking over the numerous lakes of the lower plains, we saw many caribou, feeding with the contentment of cattle on our Western prairies.

To get to moose, caribou, or mountain sheep was now only a matter of shifting the line of march. The best and most direct travelling was over this glacial shelf at heights between three and four thousand feet. Travelling thus, caribou were sufficiently abundant to supply our larder without interrupting the long marches. In descending to the timber line along the head-waters of the streams we saw moose. When making a cut behind the first foothills we saw great bands of mountain sheep, while everywhere there were fresh signs of bear. Here, wandering with primeval freedom,

were the largest of the big game animals. Surely, it is the finest game preserve in all the world.

It behooves us to protect these splendid animals against the cruel slaughter which blots the history of wild life in the past decade. Game preservation is too long a subject to take up here, but my admiration for the noble creatures that run to untroubled joys along the west of this range impels a word of caution. Some game law must be framed for this undisturbed wilderness will soon be spotted with the blood of innocent creatures to satisfy the murderous lust of man's instinct to kill. The present game laws of Alaska are a farce in their effect. They favour the Indian and the prospector but permit the wholesale extermination of the game. The only result of this law is to keep big game hunters out of that territory and to make a closed field for the Indian and the prospector to slaughter at will.

There is room for a good deal of discussion on the relative merits of allowing special privileges to the Indian, the prospector, or the nimrod. The spirit of the law and the generally accepted theory is to curb the outside hunter and allow the native a free hand with minor restrictions. This theory in Alaska is a misfit. The Indian about Cook Inlet and the Alaska Range is to-day, and always has been, a fish eater. He secures his yearly supply of salmon with such ease and despatch that for his own use he does not seriously trouble the game. It is only since the advent of the white



From a drawing by Behmore Browne

URSUS MIDDENDORFFI
The big brown bear of the eastern slopes of the Alaska Range



From a drawing by Belmore Browne

THE WHITE MOUNTAIN-SHEEP
Ovis Dalli Nelson

man with rapid-fire guns and a market for skins that he has taken to the hunt of big game. The ultimate object of this chase is easily gotten revenue, not meat. The prospector with a privilege paramount to that of the Indian is not more worthy of free meat. I admire the brave type of manhood displayed by the prospector in his quest for gold in the difficult northlands, but he follows his calling with a purely selfish lust for gold. Wealth secured, he goes to other climes to spend it. Is it not enough that Alaska should allow him to carry away its mineral riches? Why should he have a free entrance to nature's larder?

Now as to the nimrod, let us examine his claim to consideration. He starts on an expedition which, physically, is much like that of the gold digger, but he does it on a larger scale. He hires a corps of men, takes a large outfit, spends thousands of dollars, not to kill, as is the common impression, but to enjoy wild life at its best. His return is a trophy for two, a collection of pictures, and a note-book full of memoranda, all of which is a permanent record of use to future generations. The nimrod's claim to consideration is at least as good as that of the Indian and prospector, and the law in my judgment should be so reconstructed.

There is another phase to this subject from the standpoint of real and not fancied protection. The hunter is a lover of animal life, his destruction is limited to a few males with large heads, which does not seriously affect reproduction; while the

Indian and the prospector slaughter indiscriminately, females and young, and all living things. Furthermore the hunter is usually an explorer, making contributions to the annals of natural history and geography. His eye is trained to useful observations and the results of his adventures are published. Publicity is the best remedy for any abuses and where the hunter enters the gross infraction of game laws cannot remain a guarded secret as it is in Alaska to-day.

The present law prohibits the exportation of heads and skins. The hunting season is limited and the number of animals allowed each individual is stated. Professional hunters are absolutely barred by the first provision, and so far the law is a success. But the exclusion of the friend of the game animals makes the lot easy for the local destroyers. Near the head waters of the Skwentna River there are thousands of square feet covered with moose hair to the depth of three feet. Here Indians have massacred hundreds of moose in the deep snows, taking only the skins for souvenir moccasins, leaving heaps of heads and tons of meat to rot. Kenai Peninsula, right under the eye of men paid to enforce the law, is a brilliant example of the working of the present law. Moose and sheep meat is everywhere exposed for sale at all times of the year, and all over the Peninsula one finds many magnificent heads strewn about in the wilderness. At Seattle, Wash., Alaska game heads are on sale at reduced prices. These heads

I suppose were transported by aërial navigation, for the steamship companies rigidly exclude heads from returning freight.

It would seem reasonable that the best way to prevent the present wanton destruction of game in territory bordering on Mt. McKinley should be a law which would be fair to all—a law providing for a short open season, prohibiting the destruction of females and their young, and allowing the hunter to take out his heads. A very high license should be charged and efficient game wardens should be kept in the field. The Indians and the prospectors, the greatest enemies to the game, should be carefully watched, for if these are allowed to shoot every moving thing as they do now, any law, however well its framing is in theory, in practice must prove a farce.

CHAPTER V

UP THE SLOPES OF MT. MCKINLEY FROM THE SOUTH-WEST.—THE FIRST DEFEAT

WITH an abundance of fresh meat for the men and good grass for the horses and a great undulating treeless country before us, long marches were possible. On the evening of August 11th, we rose to a bluff as the setting sun softened the great waving sea of evergreen forests, extending into the unknown world of the Kuskokwim. Along our line of march the land now became much more irregular. The glacial rivers as we neared the big mountains increased in numbers and size, and the tree line ascended somewhat higher along the streams into the foothills. Heron Glacier was noted just below, pouring huge quantities of ice and rock and water out of the great gold-fringed clouds which hung on the lower slopes of Mt. Foraker, while its three peaks of ice were softened by a warm afterglow. From points near here we got the first glimpse of the top of Mt. McKinley. Its contour was a surprise to us for it indicated a double system of peaks not shown from the east or the west. We could see only the upper

four thousand feet over the ice-crested shoulder of Mt. Foraker, a double system of gable roofs placed side by side with the eastern apex slightly higher. The slopes were shingled by plates of ice which were continuous with the surface of a glacier carrying the drainage down from the median depression. Here was the roof of the continent; the prize of our conquest, seemingly within grasp, and our ambition, cooled by fifty-one days of wet feet, warmed to a new enthusiasm.

We pitched camp on the side of the vigorous stream which rushes out of the grottos of Heron Glacier. Through the waving leaves of the big cottonwood trees we watched the veiling and unveiling of the polished cliffs of Mt. Foraker, with its awe-inspiring cornices chiselled in graceful curves of alabaster. As the beans boiled and the aroma of the bacon and fresh bread drifted with the chill of twilight the echoes of the explosive noises of Heron Glacier sent a thrill of the arctic battlefield to our hearts.

A march of three days over whaleback ridges ploughed by vanished glaciers, took us to a point on a tributary of the Tatlatna River, about fourteen miles north-west of the crest of Mt. McKinley. Our camp was placed beside a foaming stream at an altitude of twenty-six hundred feet, along the edge of the last willows. A mile below we noted the zigzag of the upper line of the spruce forest which we had skirted for two hundred miles. To the east a succession of glacial benches

rose gradually for about five miles to an altitude of four thousand feet and there began the sharp pyramidal foothills which are characteristic of this area. In wandering about the camp we saw a great deal of interesting life; mosquitoes and flies were absent, but bumble bees attacked us several times. There were squirrels and marmots, and the bears were so numerous that we never felt safe without firearms at hand. An occasional wolf-track was seen and one wolf was bold enough to come right into our camp. Caribou grazed about like domestic cattle, and moose were always expected in the willows. Mountain sheep were more common in the regions north-east and south-west of Mt. McKinley. Perhaps the most remarkable bit of life we saw here was a family of black foxes following us at long range like dogs, and retreating to their earth mounds when we took up the chase.

While here a violent storm swept our camp and we were kept rather busy in holding up the tents and nursing a willow fire. The stream rose with alarming swiftness. Our tents were on a flat not more than three feet above the foaming stream. When we turned into our sleeping bags that night we felt anxious about that rising stream. Shainwald had such premonitions of a coming flood that he devised a safety signal. Placing a small log at a point near our level he attached to it a rope and this rope was taken in his tent and fastened to his toe. The wind

blew violently that night and the rain poured down in torrents. Just before dawn Shainwald felt a jerk at his toe. He quickly called all, but we were already lying in pools and when we arose we stumbled into cold water. There was no great danger at this time but in the haste and bustle of moving camp to higher ground we were thoroughly awakened.

Our position was particularly favourable for a promising attack upon the south-west ridge of the big mountain. Before beginning the climb we decided to spend two days in rest and final preparation.

In fifty-four days we had marched a tortuous course of five hundred miles through swamps and forests, over glacial streams, up and down mountain sides, through a trackless country. We had travelled afoot while the horses carried our supplies. In this march we had hoped to get to the mountain by the first of August, but had been delayed a great deal through the illness of the horses during the early part of the trip. The season was now advancing rapidly; storms were beginning to pour down from Mt. McKinley with a great deal of rain; the temperature ranged from 45° to 60° F. and the glacial streams were much swollen. Still, our position seemed so favourable, and the ascent of the mountain appeared so easy from our point of observation, that we felt certain of reaching the summit within a few days.

Our days of rest were spent in making final pre-

parations for the alpine work. We had carried with us a sufficient quantity of hard biscuits for the mountain ascent, but these biscuits had been so much in water and were so often crushed by accidents to the pack horses that they were worthless. We were now compelled to devise some kind of bread for the high altitude, because there bread could not be baked. It occurred to me that we might bake our bread in the usual way with the tin reflector, and then toast and dry it, after the manner of zweiback. For this purpose I detailed Dunn and Miller to go down the river a few miles where they could procure spruce wood, and within twenty-four hours they had successfully baked sufficient bread, and toasted and dried it thoroughly for mountain work. This I think is a new thing in mountaineering and it certainly proved excellent for our purposes.

Our mountaineering equipment was very simple and extremely light. As food for each man we allowed pemmican, $1\frac{1}{2}$ pounds per day; zweiback, 4 oz. per day; sweetened condensed milk, 4 oz. per day; and some tea. We had also a small quantity of cheese and erbswurst; both of these, however, proved unsatisfactory. Pemmican, bread, tea, and sweetened condensed milk seemed to satisfy all our wants. For fuel we had wood alcohol to be burned in aluminum stoves, and also petroleum to be burned in a Primus stove. The latter proved by far the more successful. We carried no dishes except a few cups, spoons, pocket knives, and one

kettle, in which we melted snow to get water for our tea.

There was nothing unusual about our clothes, except a large eider-down robe (the down adhering to the skin of the birds). The robe was so arranged that it could be made into either a sleeping bag or an overcoat. Our tent was made of silk, after a special pattern which I devised for polar work. It was large enough for three men and weighed three pounds. Each man carried a regular alpine axe, and in his rucksack he was to carry his sleeping-bag, glacier rope made of horsehair, provisions, and a general outfit for a ten days' stay in the mountains. This weighed forty pounds.

Mt. McKinley presented a formidable face from our camp. The upper ten thousand feet were, during the day, usually wrapped in dark clouds. The best view was obtained when the sun was lowest, and by far the most impressive view was during the long hours of the blue twilight. In the bright light the mountain seemed dwarfed. The foothills, the glacial depressions, and the striking irregularities were then run together into a great heap of mingled snow and rock, but the feebler play of light at dawn and sunset brought out all of the sharp edges, the great cliffs, the depressions, the lesser peaks, and the difficult slopes. To the north-east there was a long ridge with a gradual ascent, but this ridge seemed impossible as a route to the summit because of

several lesser peaks, which appeared to bar the way. To the south-west there was a more promising ridge, also interrupted by a spur, which however we hoped to get around. The western face of the great peak between these ridges, above twelve thousand feet, was an almost uninterrupted cliff of pink granite, so steep that snow could not rest upon it. Hence the only way to the summit from the west as we understood it at that time was along the south-westerly ridge.

Aiming for this ridge, we moved our entire camp with the horses along the southern bank of the river to a point on the main stream where it came from a huge moraine. Crossing here, we ascended into a narrow valley four thousand feet, and there pitched our camp. Here the grass was abundant, and the outlook for an easy ascent was good, but the rain came down incessantly. On the following day, with five horses, the entire party pushed over a series of moraines to a glacier which started from an amphitheatre. The ice travelling was quite difficult for the horses; deep snow and numerous crevasses made the task tedious and very dangerous. We pitched our camp at an altitude of seven thousand three hundred feet on the glacier near a part of the wall of the amphitheatre to the south-west, the only place where the slope permitted an ascent. During the night a great deal of snow fell, and on the following morning we left our horses, and in the snowstorm ascended this slope to eight thousand

three hundred feet, only to find that farther progress was absolutely cut off by a chasm the cliffs of which we afterward learned led down with a sheer drop of two thousand feet into the bed of Peters Glacier. The horses were sent to the last camp while we remained on the glacier another night, and explored the area for a route out of the gathering basin; but the only outlet was toward Mt. Foraker.

Defeat for our first attempt was now evident. There was no way over the gap in the shoulder upon which we had risen. We were, however, able from here to get an occasional peep between the clouds into a new world of great action and sublime beauty. The remarkable glacier on which we camped marked the beginning of the first of a series of interesting discoveries. Its gathering basin was a crescent in shape, about five miles wide, and walled by frowning cliffs from two thousand to three thousand feet high. Small overhanging glaciers and never ceasing streams of avalanches carried the condensation down from above while a constant train of clouds descended into the gap, dropping cargoes of snow. Thus the output of the glacier was continuously augmented. The stream was about seven miles long. By right of exploration to us fell the privilege of assigning a name, and accordingly we inscribed in honour of our colleague "Shainwald Glacier."

Rising over a low divide out of Shainwald Glacier toward Mt. Foraker we saw two other

glaciers with streams about one mile wide running parallel to each other. The first came from a system of snowfields from the Mt. McKinley slopes. The second came from an amphitheatre of Mt. Foraker. Both these glaciers had large quantities of black moraine uniformly strewn over them. This moraine we believed to be slate, therefore differing from the northern glaciers where the moraine was granite. These glaciers from above appeared to offer good routes for an attack upon either mountain, but we had not with us sufficient supplies to prolong the siege over a circuitous route. We therefore descended out of a region of perennial snows into one of perpetual rains at four thousand feet. The base camp was quickly taken down and packed and then we started for the golden lowlands where the sun was seen to shine as we looked between the clouds. Rising to a commanding foothill southward we were able to see that there would be great difficulties in rising out of the lower country to the glaciers that looked promising from above, so we now decided that the few remaining days of the closing season would be better spent by an ascent over the ice of Hanna Glacier.

In this sudden descent from eight thousand feet to three thousand feet we noted a languid, feverish feeling, a weakening as if convalescent from a serious illness. We soon learned to accept this descent of spirits with the descent of slopes as an aftermath of every climb.

CHAPTER VI

AGAINST THE WESTERN FACE OF MT. MCKINLEY. —THE SECOND DEFEAT

IN SHIFTING camp twenty-five miles from a line at right angles to the south-west of the base to a similar line to the north-west base we spent two pleasant days in travel and exploration. This march over a rolling treeless country gave us time and opportunity to study the face of the great mountain. Looking at the peak in the light of our first experience the magnitude of our task was more and more impressed upon us. Making a camp in the edge of the last spruce, within a mile of the moraine of Hanna Glacier, at an altitude of three thousand feet, we made preparations for our next assault upon the ice-armoured slopes.

Mt. McKinley as seen from this camp presents a stupendous sheen of granite cliffs and ice-walls. The foothills rise out of an old glacial shelf at four thousand feet elevation, and about ten miles from the crest of the saddle which makes the double peak of the west. The first hills are rounded by glaciation, but these are quickly succeeded by a few pyramidal peaks scraping the lower clouds at six thousand feet. These foothills lead to

Roosevelt Ridge, which extends along nearly the whole western face of the main mountain and is separated from it by Hanna Glacier. Ordinarily the clouds sweep the slopes from six thousand to twelve thousand feet, and thus blot out the upper line of Roosevelt Ridge and the huge gap made by Hanna Glacier between it and Mt. McKinley, giving the great uplift the appearance of gradual easy slopes. But the cloudless skies of night and morning alter the prospect to one of sharp contours, interrupted arêtes, and successive cliffs of rock and ice. Roosevelt Ridge, which has an altitude of seven thousand feet in the north-west, gradually rises to twelve thousand feet in the south-west. Its crests are blanketed by sheets of ice with huge cornices and overhanging glaciers to the west, and to the east many tributary glaciers carry ice-tongues into Hanna Glacier.

With our mountain equipment and some firewood packed on four horses we crossed the glacial stream not far from where it rushed out of the great green caverns of the face of Hanna Glacier. The waters boiled among large granite boulders freighted from the heights by the movement of the glacier, and after tumbling over widening bars of glacial silt, the stream narrowed, plunged into a canyon, and disappeared in the great green expanse. This river makes the McKinley fork of the Kantishna, which carries the northern Mt. McKinley drainage to the Tanana, en route to the Yukon and the Bering Sea.

On the north shore we found signs of a fresh camp. It was the first signs of human life which we had seen for more than two months. Leaving the horses to graze among stunted willows we examined the camp carefully. We had about decided that it was an Indian camp when a wrapper of a kodak film was found. We were not prepared to believe that Indians carried cameras, and sought diligently for some other signs. A pair of blue overalls and some woollen socks were found, which even yet was not conclusive. In the ground we saw the footprints of a mule, and then we concluded it was a railroad survey party. This was agreeable news, for it relieved the tension of our shortage of supplies. The main privation from which we suffered at this time was the lack of salt. Early in the campaign the horses located the salt and ate it during a single night. This did not interfere with the alpine work; in the climbing diet salt was rigorously excluded because of its faculty to produce thirst where water could not be easily obtained, but in the lower country, without bacon, and without salt, fresh meat and beans did not promise a relish for our enjoyment. Under a bush Printz picked up an old rusty covered tin can. Raising it for a better examination it was found to be full of gray granules, which we took to be arsenic, a part of a bird-collector's outfit. It might be salt, but who would taste it? If salt it was worth its weight in gold, but we had no chemical way of testing it. The relative chemi-

cal qualities of arsenic and salt were heatedly discussed, and finally some one took the risk of arsenical poisoning by putting some on his tongue, ready to spit it out quickly. With a broad grin he exclaimed, "It is salt!" and everybody at once shouted for joy. This camp we later learned was made by Judge Wickersham.

Taking a course parallel to Hanna Glacier we soon found splendid caribou trails leading in a straight line to the base of Mt. McKinley through the gap forced by the glacier. Blueberries were abundant, but they were frozen and those of us who ate them in quantities developed a serious form of indigestion. The grass had a similar effect upon the horses, as it was also frozen. Following the same trail along the glacier for eight miles we pitched camp on the evening of August 24th within a mile of the base of the frowning cliffs of the main mountain. Here the glacier made a sharp turn. and we now saw for the first time that the huge stream of ice swept the whole north-west face of Mt. McKinley and this stream as a highway offered the best route to the top.

To the east of Hanna Glacier Mt. McKinley rises in an alternate series of precipitous granite cliffs and overhanging glaciers for fifteen thousand feet; and to the west in similar cliffs and glaciers Roosevelt Ridge, a wide imposing line of mountains from seven thousand to twelve thousand feet high, extends for twenty-five miles parallel to Mt. McKinley. Below Roosevelt Ridge to the west are three

rows of foothills over which there is a successive descent to the lower glacial plain at three thousand feet.

As we were pitching the tents we noticed a big grizzly bear on our trail. He leisurely wandered over the bars of the glacial stream to the little green island where we aimed to make our base camp. We had with us plenty of fresh meat, so we did not need his carcass, nor did we want his skin, but we did not like his boldness nor his familiarity.

The great quivering mass expanded to alarming proportions as he neared the camp, and his funny dance on his clumsy hind legs, while his forepaws waved an evident desire for a handshake, was not at all funny to us who were trying to bluff the bear by putting up a brave front and a firm stand without firearms. We had only ice-axes as weapons of defence, and as the bear rose to his haunches the second time we backed up to a boulder, from the top of which we expected to defend our skins; but the bear was considerate: after eying each one separately, and then taking a side glance at the horses, he rose, sniffed the air, and turned into a great basin for the highlands, from which he watched the curl of the smoke of our camp-fires, while the aroma of caribou steaks kept his nose pointed. Our sleep that night was troubled by bear thoughts and the thunders of avalanches.

From this camp we started for the upper slopes

with the climbing equipment packed in the rucksacks. Under heavy packs we crossed the miniature mountains of broken stone to a narrow tongue of ice which ran wedge-shape down the centre of the glacier. The lower ten miles of this glacier are completely buried under an irregular cover of moraine. The travelling was extremely difficult over the glacier, though not particularly dangerous. The temperature was near the freezing point. There was bright sunshine on the higher slopes, but into the glacial gap drifted frequent clouds, and under these it was dull and gloomy. Toward night the clouds drifted over us so frequently that we found ourselves in an almost continuous snowstorm. Icy winds made a whirl of snow through which it was difficult to spot the crevasses. At the lower drop of a great sérac we separated. Dunn and Miller returned to the base camp, while Printz joined me in a desperate attempt to find a way through the maze of gaps and pinnacles. There was no way over the top, so we descended into a great blue cut, and from this we ascended into other crevasses, following one after another to the better ice above the sérac. At an altitude of eight thousand feet we rose above the settling clouds and burst into the arctic world, with all its glory of glitter and frost, and continuing our march through deep snow to an altitude of nine thousand feet we pitched the silk tent on the glacier within two miles of the south-west arête,

upon the ascent of which our future fortune depended.

The temperature was ten degrees below the freezing point and the bitterness of midwinter was in the air. We heard water far down in the crevasses, and determined to find some if possible, for we were too thirsty to wait for snow to melt. Furthermore, we desired to save the precious fuel which we had carried thousands of miles for use in this cloud-world. Opening out our sleeping-bags, we drew them as robes around our shoulders, and with a tight line we sought for water along the crevasses. Under a circle of new ice near the tent we found a miniature lake, and from it we first filled up, and then our aluminum can was filled. In the tent we made our robes into bags, crept in, and started the alcohol lamp and fried caribou steaks. Later tea was served. Outside an arctic blast rushed down the glacier, and avalanches from every side made the night air ring. There was discomfort and real danger at hand, but we were warm and at ease within the silk walls of our tent.

Dunn and Shainwald were expected to meet us here on the day following, but owing to some delay they did not come. We explored the upper reaches of the glacier and outlined the line of attack which we aimed to pursue in the next climb.

All glaciers in the Alaskan Range have a high gathering basin, out of which descends the first ice which starts the frozen stream with its freight

from cloud and peak. There are two general systems in which all of these basins may be classed. In the breaks through the range, or in the passes between high peaks along the range where clouds are driven through gaps, moisture is condensed in large quantities, and snow-fields form as a result. These snow-fields sometimes make one general basin for several glaciers, but usually there is a separate field or a plurality of fields for each stream. The other type starts from an amphitheatre, or a chain of amphitheatres, over the cliffs of which the clouds are interrupted by still higher slopes. Hanna Glacier belongs to this latter type. Its main amphitheatre is in the southwest corner of Mt. McKinley, and from it, at nine thousand five hundred feet, the train moves around the polished granite, following irregularly between Mt. McKinley and Roosevelt Ridge, taking avalanches, tributary glaciers, and direct cloud deposits in its course for twenty-five miles.

From a point near our camp we heard avalanche after avalanche thunder down the great slopes, and we felt the glacier under us shake as if moved by an earthquake. This noise of rock- and snow-slides and the quiver of the earth are characteristic of Mt. McKinley. We heard or felt them everywhere near the mountain, and the danger from this source was very great.

On August 29th we made our first assault on the slope of the main peak, selecting again the south-western ridge, which from every observation

of the mountain offered the only chance to gain the summit. In Hanna Glacier our altitude was eight thousand feet. We began the ascent in the track of a harmless avalanche of soft snow. This gave us a good slope for a few hundred feet, and then we were forced to cut steps up a slope ranging from forty to sixty degrees. Our greatest difficulty was not the work of chopping steps in the ice, but the effort of removing fourteen inches of soft snow before we found trustworthy ice upon which a safe footing could be made. Slowly but steadily we advanced against a freezing wind charged with drift snow, until the setting sun forced us to seek a camping place. We found nowhere a level place large enough for our tent, so we were compelled to dig away snow and cut down the ice for a tent flooring. This camp was at nine thousand eight hundred feet. The day following the slopes were steeper and the difficulty of cutting steps greater, but we rose to eleven thousand feet, where we were again compelled to cut a camping floor to keep from rolling down three thousand feet.

Camp was pitched in a hole cut out of the steep icy slopes; we nestled closely to get warm under eider-duck skins, and over hard blue ice. A frosty blast of wind was blowing hard crystals of snow against the silk walls of the tent, making a metallic noise. There were four of us as tightly pressed together as sardines in a box. From each there came a cone of breath which rose in curious circles to the top of the tent, and there the moisture

was frosted, falling in beautiful crystals only to add misery to our condition. All at once some one who had peeped out exclaimed, "My God! look at that!" and as quickly as we could get something around us we all went out to see the thing which stopped the jerky breath of our emotional companion. It was certainly a view to enrapture a mountaineer, but we were not comfortable enough to absorb its tremendous scenic importance. A cutting wind drove little ice needles down our necks, and under our wraps in a manner to dispel poetry. But we took the thing in quickly, as a hungry man does food, and then crept back under our furs to digest it.

Behind us were the awe-inspiring successive cliffs of Mt. McKinley, its glittering spurs piercing a dark purple sky nine thousand feet above us. The great mountain presented all the phases of the most terrible conflict of elements. Hundreds of avalanches were thundering down the sides of the giant peak, with trains of rock and ice followed by clouds of vapour and snow. Against this chaos of awful noise and lightning movement there drifted a steadily moving fleet of snow-charged clouds. Vapours were dragged down and set into violent agitation by the swift currents of the avalanches. At high altitudes we got only an occasional peep through a rift in the clouds, but this peep was full of gloomy mysteries. It was a sheen of melancholy, the noise of a great

war scene, a death-dealing breath storming down every ravine. It was a scene which in our position, with the low temperature, made one's marrow shrink. But the outlook in the other direction was quite the reverse. Here the colour was cheerful, the movement, though exciting, was rhythmical, and configuration of cloud and land, though on a gigantic scale, was enticing, while the depth of perspective led the mind on to dreams of happy fairy-lands.

Before a lilac curtain, feebly dashed with gilt, the sun was rapidly drifting, edging northward, soon to plunge below the cloud level at our feet. Seemingly but a step down, though two thousand feet below, was the upper line of a curious sea of waving clouds glistening like liquid gold, the waves crested with long lines of pearl. Over this strange sea-like cloud world, there were many fascinating optical illusions. Now we saw a mountain rise, move, explode, and vanish, then we would see a lake vague in outline, rich in colour, surrounded by an amphitheatre of ice-corniced mountains so near that we could almost touch some spurs. As we had about made out the strange picture, it dissolved into another, like the views of a stereopticon. Thus the scenes ran with all kinds of pictures to suit the fancy and imagination of the observer. Perhaps the most deceptive thing that I saw was the upbuilding of a giant peak, which for a time seemed to rival Mt. Foraker. It slowly rose out of a particularly brilliant area of the cloud

line in the south. It seemed as if the limelight was turned on this particular spot, and for a long time I could not keep my eyes away from it. The surface quivered, a huge spray was thrown up, and then a spot slowly rose dragging up with it irregularly most of the level around it, and the surface raised, burst, leaving a ragged edge somewhat like the opening through the paper-covered hoop pierced by a circus rider. Through this opening rose a vague velvety outline of a mountain; the ragged edges settled, leaving foothills, ridges, valleys, and gullies with sharp cliffs next to the mountain. It was a bird's-eye view of an exact replica of Mt. Foraker. But as the air cooled all the outlines were sharpened, all the optical illusions vanished, and this particular mountain settled rapidly, leaving a rift through which we saw, seven thousand feet below, a blue expanse of glacial ice.

The temperature steadily fell from twenty to twelve; the entire cloud level settled and had more the appearance of a quiet sea, but the glitter of gold remained, though cooled by a gauze of blue. While our great mountain and all its fantastic illusions vanished with the falling mercury there remained to the south-west two large mountains, and we almost expected them to disappear but they did not. We soon recognised these as the great peaks, Foraker and Russell. Mt. Foraker, twenty miles away, a cross-ridged, ice-crested mountain, seventeen thousand feet high;

and Mt. Russell, a pyramid of ice-plated rock forty miles south west. At nine thousand feet the slopes of both mountains were hugged by a sea of clouds.

On the day following we shook ourselves out of the snow and examined the disheartening slopes above. The entire scene had changed. There was a succession of shadowed granite cliffs and glacial walls which ran up into the glowing sky. A few luminous cloud shreds were dragging their edges along the icy spurs at about sixteen thousand feet. The western side of the giant peak was bathed in a frigid blue, but from the east there came a warm rose glow, which soon enveloped the mountain and made the thing enticing.

Dunn and Printz had already made up their minds that farther progress up the difficult slopes and into the coming winter was impossible. There was much to support this view; snow was falling almost constantly, the icy storms were sweeping the spurs, and the stilly blackness of the polar night with its awful cold was daily thickening and lengthening. We had, however, plenty of mountain food, and if we could only find some safe and sure line of attack there was yet a chance for success.

The ridge upon which we were camped at eleven thousand feet led with an ever-increasing slope to a granite cliff which did not appear unclimbable from below. But at close range and in a good

light we could see that farther progress on the south-west arête was impossible. There were successive cliffs for four thousand feet. Beyond we saw a gradual slope leading to the western peak. Over the glacier which came from the gap between the eastern and western peaks there was also a promising route. After a careful search we were compelled to acknowledge defeat, for there was no way around the succession of sheer granite cliffs.

Leaving some pemmican and fuel here to ease our packs we descended quickly over the steps previously cut, reaching our camp on the glacier at eight thousand feet on September 1st, as the parting sun threw piercing blue shadows over us. From here on the following day we made a desperate dash of twenty-nine miles over the ice and moraine to the face of Hanna Glacier.

CHAPTER VII

NORTHWARD THROUGH THE RANGE AND INTO THE CHULITNA.

WE HAD aspired to get to the top of the great mountain and the many hardships served to increase the tension of a nervous excitement which was fired by momentary surprises and inspirations in wonderful scenes. The spirit of discovery ran with our aspirations and the ascent. Here we breathed the free air of the Arctic, while the eye wandered over the snowy grandeur to the broad green splendour of the lower game lands, the visual senses drinking to intoxication while the spirit communed with nature in moods of severe playfulness. We had gone into an upper world, into the battle-ground of terrestrial and celestial forces. We had coped with a superior foe and our battle was half won when the auxiliary forces of our adversary, the advancing run of winter and its awful night of frost, called a halt.

As we descended from our second attempt we were made to realise by frozen grass and increasing snowstorms that the season for mountaineering had closed; furthermore, the north wind convinced us that if we wished to get out of the country before

the long winter and the night stilled the sub-arctic world about us, we must quickly reach the head waters of some big stream. We did not care to go to the Yukon, because in doing so we would cover explored territory. We could not return as we had come, because horse feed along the western slope of the range was already frozen. We were not yet ready to leave Mt. McKinley, provided we could only linger at some point where our retreat would not, as was likely in our present position, be suddenly cut off. Altogether, our purposes would seem best served if we could cross the range and get into the Chulitna Valley; but the possibility of such attainment seemed doubtful, in the time at our disposal, unless we were fortunate enough to find a pass within a few days' travel. Accordingly, we resolved to make a desperate attempt to cross the range to the eastern slope, and in the event of failure in this, our alternative was to make the deep waters of the Toklat, and travel thence by raft to the Tanana River.

Though thwarted by an insurmountable wall, we had ascended Mt. McKinley far enough to get a good view of its entire western face. The walls of the main mountain rise out of Hanna Glacier, which sweeps the western slope. Avalanche after avalanche rush down the steep cliffs and deposit their downpour of ice, rock, and snow on the glacier. Beyond Hanna Glacier is a remarkable ridge of lesser mountains, extending about sixteen miles

parallel to the great mountain. Its altitude is seven thousand five hundred feet at the north, and it gradually rises to eleven thousand nine hundred feet at the south. The ridge is weighted down with all the ice it can possibly carry. Many glaciers grind down the gorges on both sides, and along the western slope every cliff is heavily corniced with ice. The altitudes of the lower clouds here range from six thousand to ten thousand feet, and when looking at Mt. McKinley from the west, during the greater part of our sojourn, we could see only this great ridge, the main mountain being usually obscured under heavy clouds. For this unique geographical feature I have placed in honour of our President the name "Roosevelt Ridge." West of Roosevelt Ridge is a series of snow-free foothills, mostly pyramidal in shape. We descended a dome-shaped mountain six miles south of this ridge, from which place we made our final attack. The mountain referred to is entirely covered with ice, and its summit reached an altitude of fourteen thousand feet. This will appear on our map as Mt. Hunter in honour of Miss A. F. Hunter of Newport. In the eastern end of Roosevelt Ridge there is a huge amphitheatre, in which rises a glacier about two miles wide and six miles long; this glacier, in honour of one of our companions, received the name of Shainwald Glacier. Over Shainwald Glacier we had made our first ascent to an elevation of eight thousand three hundred feet.

As we were about ready to start on our uncertain effort to cross the range we found ourselves deserted by six of our horses. In their eagerness to get grass the animals had wandered downstream toward the main valley of the Kuskokwim. The seven remaining horses were easily able to carry our reduced packs, so we allowed the wayward ones to seek their fortunes in lowlands among the caribou and moose.

On the morning of September 4th we started on our weary march along the western foothills above the tree line. The slopes were long and difficult, and the travelling after our mountain experience proved very tiresome. Every sudden descent from the high altitudes produced a feeling of languor, with difficult heart action. This after-effect of mountain work was to us much worse than any effect of ascending altitudes. So much was the fatigue felt that as we ate lunch on a prominent hill we picked out our evening camp only a few miles away. The lunch was eaten with some relish, because we were hungry and had worked hard. It was the usual meal of boiled caribou ribs, cold and without salt; also without bread, or anything else except glacial water. While we were picking the bones our horses were searching little depressions for a few sprigs of grass which had not been frozen, and as they were being rounded up we saw several caribou. Printz with a rifle and Shainwald with a revolver crept stealthily around a hill into a ravine and soon we

heard a volley of shots. We followed with the horses and took the choice bits off a fat bull. Within an hour we were headed for the willows of a small creek, and here the nimrods spied and secured a moose, which was a very good excuse for shortening our day's march. So we camped in moose haunts in a swamp where we built a huge camp-fire and ate an incredible amount of moose steaks while our horses climbed the neighbouring hills for the vanishing grass.

Packing our horses on the following morning with an abundance of fresh meat, we then took a course for Muldrow Glacier, beyond which we hoped to find a pass. In two days' marching seven hours daily over tundra, we reached the terminal moraine of this great glacier, and we then marched south-easterly to examine the mountains. Our course hitherto had been close to that of Brooks and Reaburn, and their map, though quickly made, was found to be remarkably correct. But now we were to traverse absolutely unknown territory, and the task thus became doubly interesting, though much more difficult. In our course we first discovered a glacial stream pouring through a canyon only a few hundred feet north of Muldrow Glacier. We followed the stream into a broad valley, and there learned that the river was the output of a system of glaciers among a cluster of sharp peaks seven miles east of the Muldrow Glacier.

As we left the lateral moraine of the big glacier,

travelling on the gravel bars of the newly discovered river, we moved through a great broad basin, which we later discovered extended nearly fifty miles north-easterly. To the east were snow-capped mountains from seven thousand to ten thousand feet high, while to the west were brown weatherworn mountains of from five thousand to seven thousand feet in altitude. The valley had a general width of seven miles and an average elevation of four thousand feet; and I named it, in honour of one of our companions, Dunn Valley. On September 8th we camped in the canyon of a small stream at the base of a rounded black mountain, to the west of which we hoped to be able to find a pass.

After a hasty meal of unsalted moose-steaks I asked Printz and Dunn to join me in an ascent of the mountain before us, which we called Black Head. The climb was steep, but not difficult, and on the way we found many tracks of grizzly bears, caribou, and mountain sheep. In the course of an hour we reached the summit at an altitude of five thousand four hundred feet. From here we had a magnificent view of a great expanse of country, upon which it is probable no human eye had rested before. Thirty-five miles to the south-west, looking across unnamed mountains twelve thousand feet high, we saw the summit of the unconquered culminating peak of North America. The upper walls of this great uplift from this side had for us a new aspect. An

almost constant stream of clouds swept over and around the mountain from the east, and a blue electric glow softened the rough outline. Now and again we could see the summit, and from here it resembled very much the crown of a molar tooth. Four tubercles were distinctly visible; the saddles seen from the west formed two, and to the east were two rather higher and more distinct. These tubercles of this giant tooth are separated by large glaciers, whose frozen currents pour down very steep slopes. If it were not so difficult to get at this side of the mountain, we reasoned that here the upper slopes might offer a promising route.

Apparently continuous with Mt. McKinley, and extending north-easterly far beyond our position, there was a sharp icy ridge in which we saw several mountains over ten thousand feet high. We thought we could break through this ridge about ten miles northward from our position, but the prospective pass which we had seen from below was only a small valley walled off by the main ridge. About eight miles up the valley we saw the benches of a large stream and on the banks spruce trees. The sight of spruce raised hopes of a big camp-fire and a good camping-ground with better prospects of grass for our poor, half-starved horses. Along the upper slopes, in the most inaccessible places, we saw long lines of snowy dots zigzag on the sunny rocks; these were mountain sheep in great numbers, but our larder

was too well stocked and our time too precious to seek them. Around us and toward the unnamed brown mountains northward we saw innumerable ptarmigan.

After plotting our course for the following day, we descended and camped among some scrub-willows. Here we found coal in the stream's bed, and near by signs of petroleum. On the day following we moved our pack train to the river we had seen from Black Head, but, much to our disappointment, the southerly outlook here did not promise a pass. Beyond, the main valley widened, the glacial streams became more numerous, willows were larger, and signs of game more abundant. Our camp on the 9th was near a salt-lick, where many animals had congregated to eat the salty soil. The drainage all along Dunn Basin was northward into the Toklat River. The connecting A-shaped valley forming the basin had been carved out by some ancient glacier. To the eastward the basin ended in a series of hills, and there we felt that we were certain to find a pass. On the 10th we camped on a large stream at the end of our newly discovered basin, and from here, looking southward, we discovered a wide cut through the ridge. Through this opening, over a glacier, came the moist easterly winds. The horses were desperately hungry and were bent on deserting us. To guard against this we set up a watch through the night, but in the dense blackness of midnight they

escaped and back-trailed. On the morning of the 11th, while Dunn and Printz searched for the horses, Shainwald and I explored the prospective pass. In an hour we had ascended the face of the new glacier and walked over ice very much crevassed. Ahead were two possible routes to cross the range—to the north and to the south of a nunatak which projected above the glacier. We gradually rose to an elevation of six thousand one hundred feet, crossing hundreds of crevasses in a thick snowstorm, and as we came to the end of the easterly arm of the glacier the snow-cloud vanished, the weather cleared, and with a good deal of pleasure we looked down into the green valley of the Chulitna, the main tributary of the Susitna River. The descent however, promised to be very difficult for our horses, though possible in an emergency like ours.

We next sought a course through deep, soft snow around the nunatak to the westerly arm. A cloud of snow swept the glacier, and so thoroughly blotted out the huge mountains to each side that we were compelled to travel by compass. For nearly two hours we marched up this arm, keeping our glacier rope tight, almost expecting to drop into a crevasse any moment. Suddenly we broke through the clouds and just beyond Shainwald's toes appeared the brink of a precipice with a perpendicular drop of three thousand feet. We quickly stepped back, and then beheld the most desolate mountain wilderness which it has ever been

my privilege to behold. Here were the easterly foothills of the McKinley group, black ragged peaks, dotted by spots of fresh snow. We were at an altitude of seven thousand feet, and these mountains were a little higher. The most remarkable feature was their apparently uniform height of about seven thousand five hundred feet. Over this expanse of jagged peaks there drifted heavy silver-edged clouds. Sometimes we could see over them, at other times under them, but at nearly all times through them. This remarkable effect also induced a mirage, which drew up some mountains to such heights that we could see huge needles of rock so far above us that we believed ourselves discoverers of several peaks that rivalled Mt. McKinley.

As we turned, the clouds were now for a time swept out of the divide by a strong northerly wind, giving us a good view of the glacier over which we had advanced in a snowstorm. It is about eight miles long and somewhat less than two miles wide. The highest mountains on each side are eight thousand feet, and from these several small tributaries pour down their frozen output. This new glacier I have named Harvey Glacier, in honour of Mr. George Harvey.

The drainage from Harvey Glacier spreads out into numerous channels over a great bed of glacial silt about a mile wide. This takes a course almost due north across Dunn Basin, and then it enters a canyon, after which it probably takes an easterly course to the Toklat River.

Nearing the centre of Harvey Glacier, we met the recovered pack-train, carefully guided by Dunn, Printz, and Miller, between two great pillars of granite, which mark the gates of the divide. From here the task of getting the horses over and around wide crevasses became extremely difficult, and as we ascended higher the horses frequently slipped into wide gaps, deceptively bridged by snow. Our horses, however, were now pretty well used to all kinds of hardships, and, though they were thoroughly frightened by frequent falls into dangerous cavities, they carried their packs nobly and safely over the divide.

The most difficult task for the horses, among their long series of hard adventures, was the descent from this glacial pass. In less than two hours they came down three thousand feet at an angle sometimes too steep for the men. It was a route over sharp stones, ice, and frozen ground; but the animals, with their feet and legs cut and bruised—leaving bloody stains everywhere in their trail—followed us without being urged toward the green fields of the lower valley. We were lucky enough to cross a green slope of long young grass just as we were aiming to strike camp, and from here the famished animals refused to be urged on, so we quickly removed their packs that they might eat to their utmost capacity. It was their first feed of grass which had not been frozen, for more than two weeks.

CHAPTER VIII

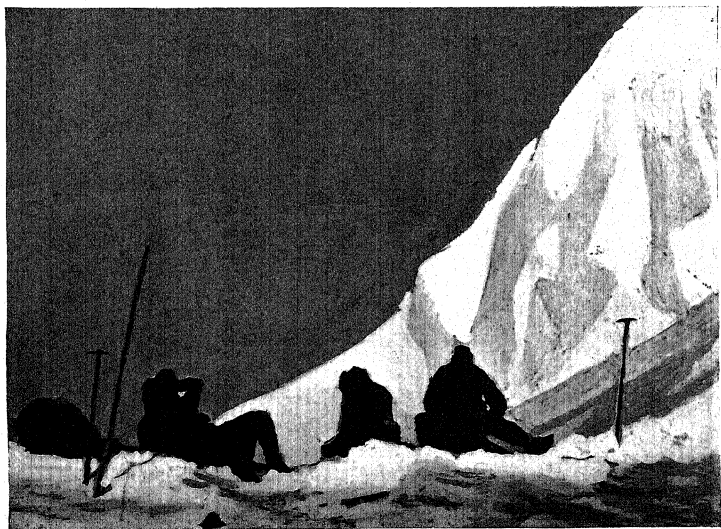
FORDING, SWIMMING, AND RAFTING THE CHULITNA

AS WE tumbled out of the clouds which were compressed and driven through the newly discovered pass, we left behind us for a time the icy winds of the early winter, but the gloom of the coming arctic night, was daily thickening. From seven thousand feet we suddenly dropped to three thousand feet, into an unknown land; so far as we knew there were neither Indians nor prospectors within one hundred and fifty miles. What the future had in store for us could only be guessed at; we had seven horses thin and hungry, but the country over which we were about to move promised at least sprigs of willows and cottonwood trees upon which the hardy creatures could subsist. The land, however, was not a horse country, at least not to the south in the direction in which we must push to the coast. Every little stream from the great range cut a huge canyon across our track. The only chance was to keep close to the Chulitna, ford and swim and cut a trail through the thick underbrush, pushing south quickly and desperately to



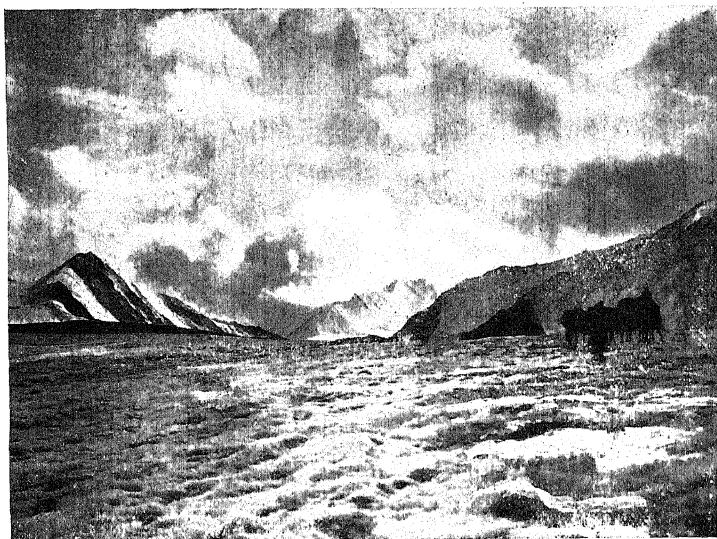
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CUTTING STEPS IN THE ICE AT 11,000 FEET



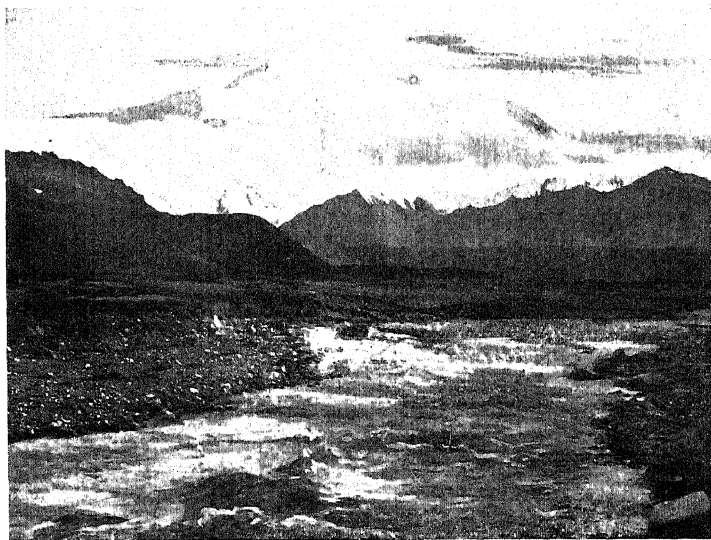
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BREAKING CAMP ON THE SOUTHWEST RIDGE AT 10,000 FEET
Steps were cut for 3,000 feet up this steep wall



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HARVEY GLACIER
Over which a new pass was discovered



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MT. MCKINLEY FROM THE NORTHWEST. 19 MILES DISTANT
The Kantishna River

rafting water before the advancing winter imprisoned us in the heart of Alaska.

The food supply, though not dangerously low, was such that we were anxious to get to Cook Inlet quickly. Along the western side of the range we could count on game to supply our larder, but along the east there was no such security of a supply. Before crossing the range we counted on the uncertainty of game in the Chulitna and packed our horses with all the moose and caribou meat that could be carried. This meat, now two weeks old, was not particularly appetizing, and furthermore we must eat it without salt, for our last find of salt was now exhausted. There was no longer any flour, sugar, or bacon. Indeed our meals were made of highly coloured and highly scented moose steaks and beans, both without salt, and tea, mixed with dried onions, without sugar or milk. The food was satisfying, but it did not go down easily.

We had carried a fair supply of wholesome food, but there is a limit to transportation facilities in this kind of pioneer work. Hunger is the great call for action to all life in the northland, and it was ours more keenly than ever at this moment. The dogs and horses and wolves and foxes, all seeking to satisfy the same pang, helped themselves from our scant supply, and now we must either seek their sources or sacrifice our horses. There was ever before us the possibility that we might be detained for the winter as was

Lieutenant Heron, and this outlook with our food supply nearly exhausted and our clothing in tatters with neither coats, shoes, nor hats caused much anxiety, while as a precaution against starvation or freezing we carefully guarded a few necessities. The matches and ammunition were securely packed in several waterproof coverings, for with a liberal supply of these in a land where food and game could be secured we felt safe. We also reserved a supply of our alpine food sufficient to support us for about one month; thus with the horror of the winter before us there was still the hope of ultimate sustaining powers. Our food prospects without salt were not pleasing to the palate, still we could keep the inner fires burning.

At breakfast on September 9th, these thoughts took definite shape while I watched the anxious solicitude on the chilled faces of my companions. Our camp was in the first willows below the descending snow line. A piercing frost had caused us to shiver all night, and as we came over to the feeble glow of the willow camp-fire there was an exchange of confidences which clearly ran to premonitions of an arctic winter imprisonment. The flat taste of the meat, the insipid and repulsive saltless beans, and the onion tea did not allay this spectre of hard luck. In the midst of all this perplexing care there was one redeeming note of joy. Our horses for the first time in weeks were lying in tall green grass, with stomachs full, grunting with

delight which sent gladness through our despondent hearts. Good, faithful creatures, how we were attached to them at this time! They had followed us through forest and tundra, over icy rivers into the snow clouds of the big mountain. They had learned to climb steep slopes and to cross glaciers which I never would have believed possible for a horse. They were almost human in their loyalty to the aim of our expedition and as each man had a special reason for his friendship for a special horse, to see the horses full and happy was to manifest the best wishes for our animal friends.

The horses having been packed with the precious remnants of the season's supplies, we started along the small glacial stream which drained the pass, and as we neared the timber line we took a southerly course over tundras and rolling hills into a clear stream. We followed this creek several miles into a canyon but could not keep this course because of the narrowing of the canyon and the large boulders. Ascending to the brim we still kept a southerly course along the edge of the cliffs to a high bluff overlooking the valley of the Chulitna near its main western tributary. We had covered about fifteen miles, had gotten blueberries and currants, and were offered ravens and ptarmigan. The march though difficult and tiresome cheered us up very much for though we saw no large game we found good grass for our horses and saw that we were nearing large rivers which we knew would take us to tide-water swiftly.

Around a bright fire of stunted spruce we watched the sun settle behind the saw-tooth ridge through which we had just come. A brilliant afterglow softened the jagged peaks and warmed the shivering blue of the high snow sheets. There was much colour in the lowlands, the cottonwood trees were golden, the willows had changed to red, the mosses were fired by orange and cardinal, the spruce and alders were darkening. It was all remarkably beautiful but it led to the thought of an early winter which we were not prepared to face. That night a beautiful moonlight sent a thrill of exaltation through us as we watched the great lines of mountains about waving their cloaks of snow in changing hues of blue and purple. The foxes barked, the ravens screeched, the ptarmigan laughed, and at long range we heard the cry of wolves and the rumble of avalanches. It was an interesting shrieking wilderness to which we felt like adding the cry of human voices.

As the moon sank into a glacial cut with a great dark cloud the east paled, the fresh snow of the peaks glittered in gold, the tree tops brightened, but the frost increased. With the rising sun there came a rush of wind out of the glacial basins that made our teeth chatter. At the morning camp-fire with a cloudless sky we were able to study the new surroundings to good advantage. Looking westerly we saw a large gap through the range which seemed to offer a better pass than the one we had taken. Below this gap were three sharp

snow peaks about nine thousand feet high, and a few miles eastward a sharp black peak. Large glaciers were noted here collecting the combined precipitation. We discovered from another point that out of the main gap came another glacier. The streams from these glaciers united with other streams to make a large river. This river has been named in honour of my friend and arctic colleague Mr. Herbert L. Bridgman, of Brooklyn. Bridgman River takes a south-westerly course about twenty miles from the range, then plunges into a canyon and joins the clear stream from the broad pass, making the Chulitna.

In our next march the underbrush was so thick and the canyons so numerous that we were forced to take the sand-bars of Bridgman River for a highway.

Getting into this glacial stream we found excellent travelling, but the slews soon narrowed, and led us into a canyon with walls three hundred feet high. The rushing milky waters among richly tinted cliffs crowned by trees in beautiful foliage made a picture sublimely fascinating; but just at this time we were not so much interested in landscapes as we were in making rapid progress. We were still anxious to examine Mt. McKinley from the east, and all our energies were bent on getting to the mountain as quickly as possible. The low mountains about were blanketed by newly fallen snow, and the temperature was falling to the freezing

point every night. We desired to get out of this canyon, and cut a trail, but we dared not lose the time. Fully knowing the danger of following an unknown stream through a canyon, we still had no alternative.

We marched down-stream, crossing from bank to bank as the river turned, to find footing for our horses. At first these crossings were not difficult, but the stream gathered force very rapidly. On the second day's march down-stream the horses were compelled to swim at almost every crossing, and it was necessary to cross the river thirty to forty times daily. The men tried to ride the horses, behind the packs, but in swift streams they were frequently thrown off. For three days we swam and forded this icy stream, and then we were aroused to the dangers of the task through an accident in which a man and a horse were carried down-stream and thrown against a cliff. A similar accident was likely to occur at any time. The horses could not be taken much farther. For the safety of ourselves and our outfit we now sought to build a raft.

The Chulitna proper is formed by the union of the glacial stream, Bridgman River, down which we came, and a clear-water stream of somewhat less volume, the latter draining the extensive low country towards the head waters of the Cantwell River. About two miles below this fork the canyon was considerably broken down, and here we found small flats covered with tall cottonwood

trees. In the absence of better wood we camped here and built a raft. The cottonwood trees were fifteen inches thick, about eighty feet high, remarkably straight, and free from limbs. We cut logs thirteen feet long and carried them to a convenient launching place, where we fastened them with cross-bars, lashed by ropes, making two tiers about eight feet wide. After the raft was finished we learned to our sorrow that it would barely carry two men. The wood was evidently too heavy for raft-building.

Printz and Miller floated the raft, while the others followed with the horses. The stream got larger, more rapid, and ever more dangerous to swim. After having gone only two miles we saw dry spruce trees a short distance westward up a large creek of clear water. Here we camped and built two good rafts, and then came the sad task of leaving our horses. Good, faithful animals they had been; it seemed heartless to leave them to meet an almost certain death, either as a result of deep snow or from the onslaught of wolves. Each man had among the animals one or two pets, and no one had the boldness to deliberately kill any of the noble creatures. The grass was good here, and we argued that when the deep winter snow came they might possibly dig under it and find a bare subsistence. On this clear stream, about eighteen miles north of the big glacier, we left seven of the finest and most faithful horses that ever traversed the wilds of Alaska. We after-

ward learned that all the animals were still living after two winters.

Taking to the rafts, we quickly descended the Chulitna through a series of small canyons divided by cross-canyons. Early in the afternoon of September 19th, we camped on a bar about eight miles southeast of the moraine of a great glacier. The lower end of this glacier had been partly charted by government parties, but nothing was known of its upper reaches. We now set for ourselves the task of exploring this glacier, and over it the eastern slopes of Mt. McKinley, which had not yet been seen by us.

Somewhat later we discovered a smaller glacier about twenty-five miles south which drains the eastern slopes of Mt. McKinley. These two glaciers I have named in honour of my wife and daughter, the larger Fidèle Glacier and the smaller Ruth Glacier.

With our outfit and supplies for three days packed in our rucksacks, we ascended the terminal moraine on the following morning, and then climbed for eight miles over the most wonderful accumulation of glacial débris that I had ever seen. At the first bend we left the glacier, and ascended the steep slopes of a series of mountains, from which we hoped to see the course of the glacier and the eastern face of the great peak.

CHAPTER IX

DOWN THE SUSITNA.—AROUND THE ALASKA RANGE

THOUGH our mountaineering ambitions were hopelessly frustrated we had succeeded in pushing around and through the Alaska Range over unexplored country. We therefore added a good deal of material to the annals of pioneer research. Before leaving the cloud piercing spires of Mt. McKinley we had planned to make a rapid reconnoissance of its eastern approaches and thus obtain data for a future expedition. For this purpose we now followed Fidèle Glacier into the foothills, seeking to reach a favourable point of observation.

We climbed to an elevation of six thousand feet, but then our progress was barred by cliffs. From here, however, we were able to map Fidèle Glacier and a large mountain area. The glacier starts from the north-east ridge of Mt. McKinley and flows almost due east for fifteen miles, where it receives a large arm from the north. Five miles south-east of this another arm swells the bulk of the great icy stream, and then it takes a circular course, swinging toward the Chulitna. Its face is about seven miles wide, its length is about

forty miles, and the lower ten miles are so thoroughly weighted down by broken stone—the product of landslides—that no ice is visible. It is thus the largest interior glacier of Alaska, and it probably carries more moraine material than any other known glacier.

Mt. McKinley from the east gives a much clearer impression of great altitude. We could not see the lower ten thousand feet, but the upper slopes though difficult are more nearly accessible than those of the west. The upper ten thousand feet are rounded like a beehive, and three spurs offer resting places for glacier ice, over which it was thought a route to the summit might perhaps be found.

The season had now so far advanced that if we cared to avoid being detained for the winter, we saw that we must take to our rafts quickly and descend the Chulitna River. We had still to raft sixty miles of an unknown stream. Our supply of provisions was nearly exhausted, we were hatless and almost shoeless, and our clothing was torn into rags.

Returning to the rafts at noon we quickly packed our belongings to start down-stream. The river as we descended split into numerous channels and spread over a wide flat. Rafting was very difficult,—the water was so shallow that the rafts went aground every few miles. To float them we were compelled to jump into the water and push. The raft would suddenly slip into deep

water and we would be forced to hold on and crawl out on the logs like water rats. This rafting life was very exciting—plunging from wide foaming rapids into the boiling deep of narrow channels, at a railroad pace, under overhanging trees, over great boulders, and into dangerous log jams. We were kept dodging dangers from every side, the raft with its precious load of records and instruments was under water often, but we were making good progress to the coast, and all of our hardships were belittled by this pleasant prospect.

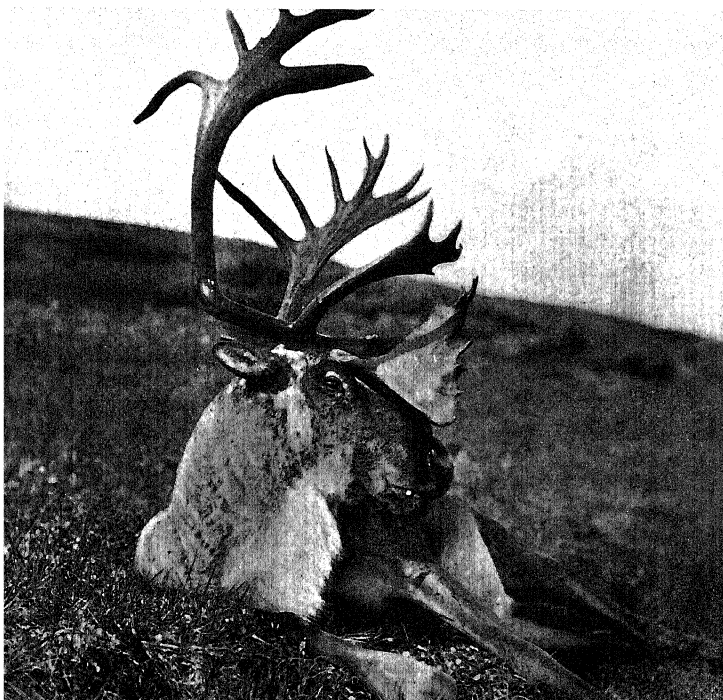
About twenty miles below Fidèle Glacier we noted the moraine of Ruth Glacier which pours its ice through a deep gap leading to the northern face of Mt. McKinley. From the glacier came a vigorous stream—the Tokositna; and at this junction the Chulitna made a sharp bend easterly and soon after an equally sharp turn southerly, plunging into a second canyon. As the rafts went rushing through the canyon on the following morning, judging from the rapid drop of the river bed and the abrupt walls of the canyon, we began to look for dangerous falls. The river so far as we knew had not been rafted or boated before and there was good ground for expecting a Niagara below. To guard against such a drop we kept a rope coiled and a man ready to jump off and swim ashore. The prospect for the swimmer was not a pleasant one but we were not forced to test the method of precaution.

As we were emerging from the gloomy canyons we spied two tents on a bar of silt. The sight of these tents created quite a commotion among the rafters. It was the first speck of human life outside of our own party either white or red which we had seen in nearly four months. Aside from the joy of meeting a fellow-creature in a far-off wilderness, we were keenly interested in the chances of getting needful supplies. Not that we were nearing starvation, for we had plenty of moose meat, pemmican, and beans, but we had nothing else. With a good deal of excitement we pulled ashore and found there two groups of prospectors sluicing gold. They believed themselves the only people in this part of the world and we were pretty sure that we were the only adventurers about Mt. McKinley. A good deal of explanation followed while we were marched to a tent where some one detected the odour of fresh bread and bacon, things foreign to our camp for some time. The miners had had no fresh meat for three months but they had everything else which we wanted and we had an abundance of moose meat, somewhat black and gamey because of its long journey from the west, but still it was meat. In exchange for this meat we got sugar, tea, salt, and tobacco. We were told that the river was clear below, that we could reach the trading post at the station with our rafts in two days.

We lost very little time for the water in the



BRIDGMAN RIVER
The junction of Bridgman River and the Chulitna



THE MT. MCKINLEY CARIBOU



OUT OF THE CLOUDS DOWN TO THE CHULITNA



OVER AN ICE BRIDGE

river was lowering and the temperature was falling fast. There were still thirty miles of the troublesome Chulitna, with its tumbling shallow streams, before we could get into the deeper water of the Susitna. In coming out of the Chulitna we ran aground often, and were frequently entangled in snags. A few miles below the forks we camped at a point from which we got a splendid view of the four great peaks of the Bolshoy group.

Looking over a low tree-covered country we saw rolling foothills leading to sharp black peaks and beyond the perpetual snow of the Alaska Range.

Floating down the Susitna was a delight compared to our troubles on the Chulitna. The beautiful autumn foliage, the clear winter air, the migrating birds, and the absence of mosquitoes made rafting down this great river of mud a fitting termination to a series of very hard exploits. At the station we secured an old dory and in it we paddled down the lower Susitna through the delta into the treacherous waters of Cook Inlet. We arrived at Tyonok on September 26th, just four months after our start. In that time we had walked over seven hundred miles, and by boat and raft we had travelled three hundred miles; we had explored a good deal of new territory; we had ascended Mt. McKinley to eleven thousand four hundred feet, encircled the McKinley group, and had made a fair geological and botanical collection. Altogether we had done all that

determined human effort could in the short interval of an Alaskan summer.

Mt. McKinley offers a unique challenge to mountaineers, but its ascent will prove a prodigious task. It is the loftiest mountain in North America, the steepest mountain in the world, and the most arctic of all great mountains. Its slopes are weighted down with all the snow and ice that can possibly find a resting place, but unlike Mt. St. Elias, the glaciation is not such as to offer a route over continuous ice. The area of this mountain is far inland, in the heart of a most difficult and trackless country, making the transportation of men and supplies a very arduous task. The thick underbrush, the endless marshes, and the myriads of vicious mosquitoes bring to the traveller the troubles of the tropics. The necessity for fording and swimming icy streams, the almost perpetual cold rains, the camps in high altitudes on glaciers in snows and violent storms bring to the traveller all of the discomforts of the arctic explorer. The very difficult slopes combined with high altitude effects add the troubles of the worst alpine climbs. The prospective conqueror of America's culminating peak will be amply rewarded, but he must be prepared to withstand the tortures of the torrids, the discomforts of the north pole seeker, combined with the hardships of the Matterhorn ascents multiplied many times.

PART II
THE EXPEDITION OF 1906

CHAPTER I

WITH THE PROSPECTOR INTO A NEW GOLD COUNTRY

THE opportunity to renew the attack on Mt. McKinley did not again present itself until the spring of 1906. I had taken up mountaineering to offset the home-destroying call of the Arctic but this first taste of mid-Alaskan life with its sheen of mountain magnificence, its haunts of big wild animals, and its gamble in gold and copper mines instilled an intoxication worse than the return habit of polar travellers. Alaska to-day is a land of boundless opportunities. It is the richest gold-bearing region in the world. Copper and other minerals promise great return. The fisheries and the big game will interest many for long years; but to mountaineers it is sure to be a stamping ground in the immediate future, for those who like ourselves are bent on first ascents.

While at Seattle, outfitting for our second alpine campaign, we soon became infected with the restless spirit of the prospectors. All Seattle and the Pacific coast was on the verge of a renewed Klondyke stampede, but no focus had been fixed for the rush. The greatest enthusiasm was directed towards the district surrounding Mt. McKinley,

and the head waters of the Kuskokwim, the Kantishatna, and the Yentna were specifically outlined as promising ground. All of this was happily in line with our work of climbing and exploration.

After a month of great anxiety and hard work there was a sudden lull, the engines puffed, and the steamer *Santa Ana*, with a cargo of Alaskan dreamers, including ourselves, their weird outfits and horses, was en route for the great land of promise, the golden north.

Gliding softly through Puget Sound on the morning of May 16th, we admired at long range the snowy crests of the coast mountains, comparing the various peaks with Mt. McKinley against which our efforts were directed. Along the rugged shores of Vancouver Island, into the remarkable chain of evergreen islands, through an inland sea of quiet grandeur to Juneau, four days and three nights we breathed a balmy atmosphere, feasted upon wonderous scenery, and learned much of the mission of Alaskan travel. Every one was after gold or copper or tin, or some mineral which was to bring sudden and easy riches. Poor fellows!—all intoxicated with the gold fever, or yellow peril as we styled the prospector's spirit. Four months afterward many of these men returned depressed, melancholy, and cursing their fate, but in another year they will again be on the same chase after the elusive glitter of the yellow metal.

Juneau is the new capital of Alaska. It has long been the business centre of south-eastern

Alaska but Sitka had previously retained the government and its honours mostly because it was in earlier days the most active town. Juneau owes its present importance to the great quantities of low-grade gold-bearing quartz discovered in its vicinity. The town is seemingly set in steps cut out of steep mountain slopes, picturesque beyond description, but with the present outlook of earthquake results, the town site is in great danger. It would need but a slight shake to bury the city under mountains of rock. Juneau people however ridicule this idea quite as the people of Valparaiso did, and are perfectly willing to trust to fate. The *Santa Ana* tied to the dock early, but the town was open full blast. The big Treadwell stamping mills on Douglass Island were sending up huge cones of smoke. From the chimneys of almost every house of both towns there came jets of smoke rising into the clear crisp air between the great cliffs which surrounded the vicinity.

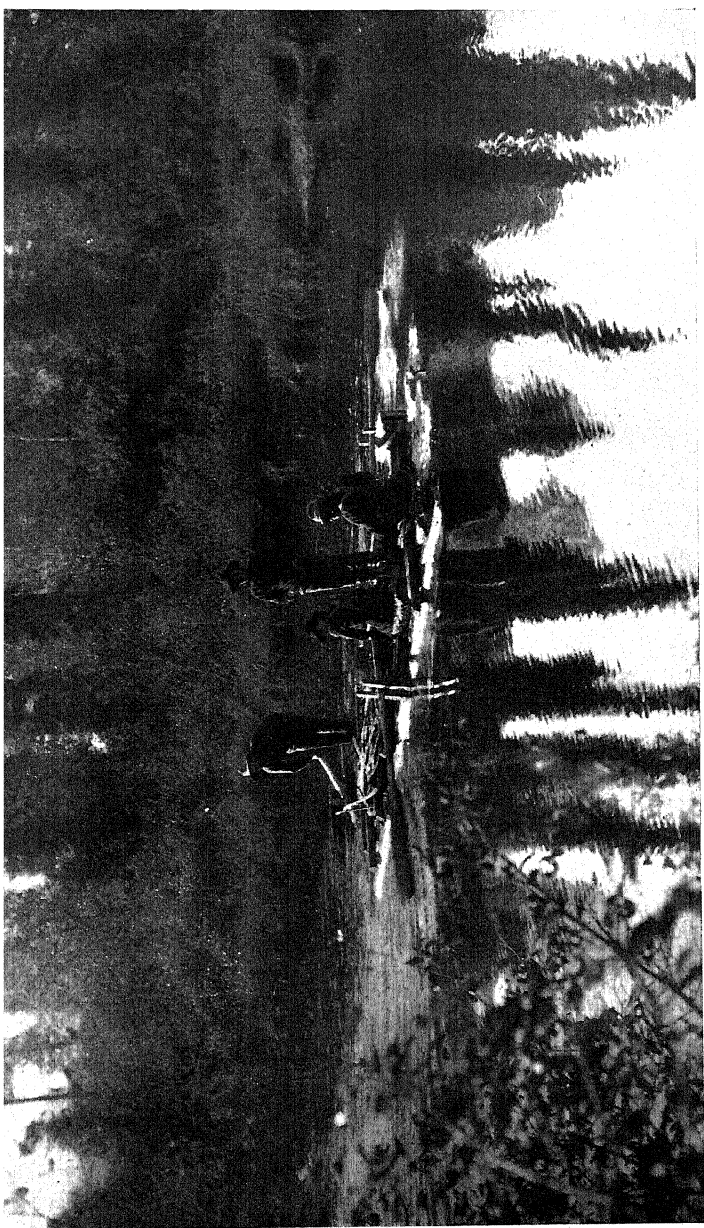
The run to Sitka was serenely delightful, but the town had profited little during the three years which intervened between our visits. A new series of totem poles had been erected. The Greek church had been painted, but the place presented a study for the tourists interested in the Alaska of yesterday. To the passengers of the *Santa Ana*, the prospector, the nimrod, and the mountaineer, who were interested in the modern awakening of Alaska, Sitka had little to offer. In leaving Sitka

we plunged from the quiet inland seas out on the ever stormy swell of the Gulf of Alaska, and then the drift of conversation rose from seasickness to the bigness of Alaska.

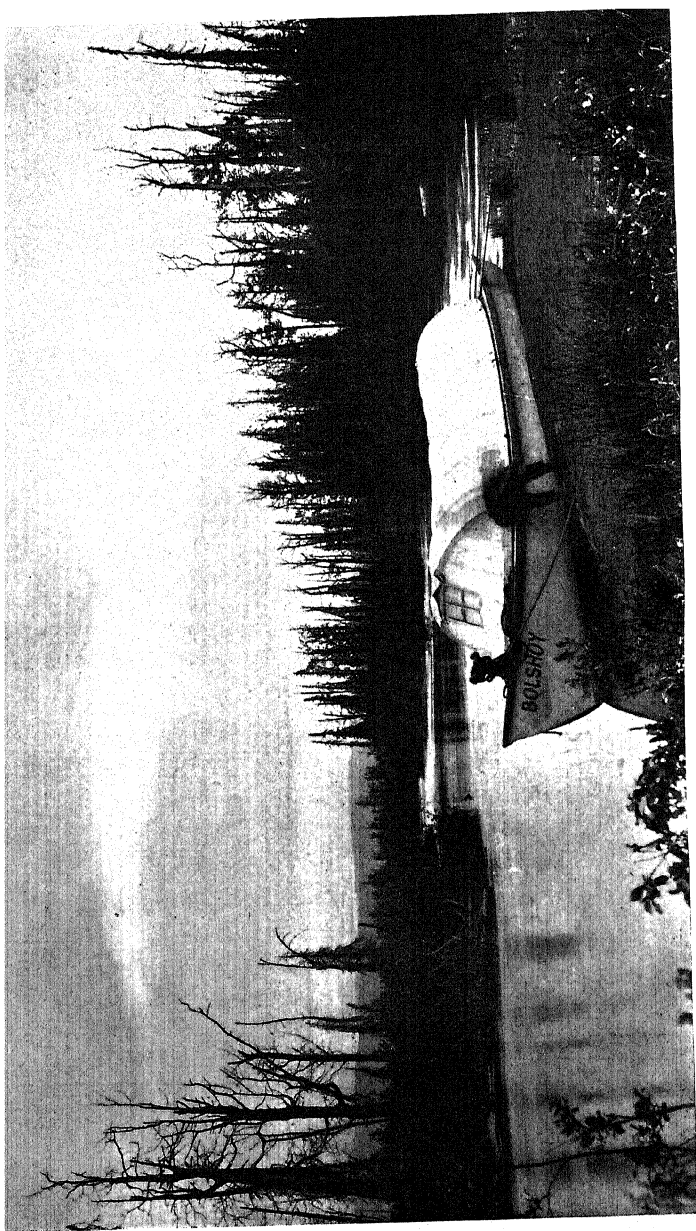
Like all new countries Alaska is overrated and underrated by the pioneers. It is put down as an arctic desert or as a semi-tropical Eldorado. As a matter of fact this great northland has within its boundless limits both the worst arctic temperature and the most agreeable temperate climate. In the interior north-east it is colder in winter than at the North Pole, while the south-west, moderated by the Japan current, has a climate comparable to that of Baltimore.

Alaska is a large country. Its coast line with its enormous indentations is said to be equal to the circumference of the globe. It is twelve times as large as the State of New York. It contains some of the greatest rivers of the world, and there is surely no place on earth where there are such picturesque mountain areas.

We stopped, among other places, at Orcha, and since everybody was eager to get to Cordova, a new boom town from which a railroad is projected into the Copper River country, we followed the excitement. After wading through mud and swamp we finally found ourselves in a narrow gorge near a small lake, a central street lined on both sides for three hundred feet by shanties and tents filled by men in various stages of intoxication, all trying to sell town lots and whiskey. Browne and Parker



RAFTING



MOTOR BOATING IN THE NORTH COUNTRY WHERE DUSK AND DAWN RUN TOGETHER

entered one place more attractive than others where a phonograph was noising popular airs. Browne asked for the cylinder "Absence Makes the Heart Grow Fonder." The bartender sang out in a loud voice: "We ain't got it, but we have what makes the jag grow longer."

There is a great difficulty in getting men to work on the Alaskan railroads. Agents of the road secure men at Seattle, furnish them with transportation and other expenses, and send them to Alaska. These men as a rule are of the hard luck type, ready to jump at anything in haste and regret at leisure. On the *Santa Ana* there were about one hundred men for the Alaska Central Railroad at Seward, and most of these yielded to the boom spirit at Cordova, remaining to work on the Copper River Railroad. When we arrived at Valdez and Seward, about one half of the people were eager to rush to Cordova to take advantage of the boom while the others were eager to get to the Yentna diggings. We might easily have secured two hundred recruits for the effort to climb Mt. McKinley, but previous experience had taught me that prospectors eager to get to a new diggings are of little use as helpers in an exploring enterprise.

At Seldovia we were forced to transship to a smaller steamer to take us up Cook Inlet. We anchored off Tyonok on the 29th day of May, and began at once to establish ourselves on shore.

Our outfit was a very large one. We were prepared to push a party of ten men to Mt. McKinley

and continue a siege for five months. A double system of transportation was planned for this purpose. A pack train of twenty horses purchased from the Yakima Indians as before was to move supplies across country, and a specially constructed motor boat was planned to ascend the large easterly rivers. Our food for the low country was similar to that of the prospector—flour, bacon, beans, and the various accessories packed in waterproof bags of fifty pounds each. There is no dock and no lighter at Tyonok. So our things were thrown into dories and pushed through the surf by Indian boatmen to a wide sand spit. While some of the party watched this task and kept a check on our baggage, others were preparing the horses for their exciting plunge. The animals were raised in slings and lowered into the rushing cold waters to swim ashore. With the motor boat and dories we tried to guide the snorting animals to the nearest beach but often they chose their own way and gave us an exhilarating chase.

Several horses were nearly lost in this effort, only the speed of the launch and the ingenuity of our packers Printz and Barrille made their rescue possible. Later the vessel steamed closer to the shore and went aground to make the task of the horses easier and then they were quickly thrown over and as quickly the shivering creatures swam for the shore, but as they did a group of Indian dogs that had assembled made an assault. Many of the first horses turned their hoofs at the howling

creatures, but later another assault was made and the wildest horses stampeded, four towards Mt. Redoubt and two northward along the shore.

One half of our baggage and outfit was put into the launch and then the boat was anchored in the stream; the other things were taken ashore by the Indians under the guidance of Mr. Finch, the local storekeeper. In due time we packed our things from the mud of the beach, made a pile above high-water line, covered it to keep the rain and the dogs off, and then pitched a big tent and placed in it a Yukon stove burning coal which we gathered from the beach.

Without any special orders on my part every man quickly devoted himself to his special vocation. Porter with his numerous instruments hustled about to get the local time, the latitude and longitude, and also a base line for triangulation. Parker with the hypsometer and barometers made sea-level observations for future altitude determination. Miller with all kinds of cameras posed the Indians and snapped picturesque effects. Altogether it was a busy day.

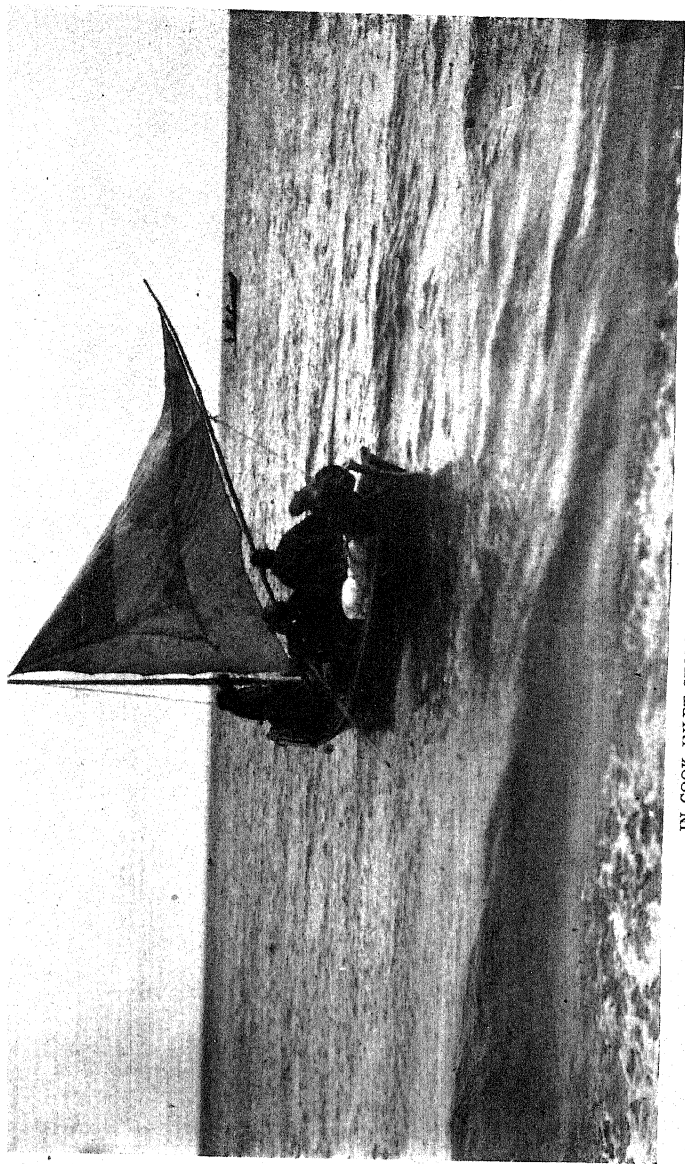
CHAPTER II

PREPARATIONS FOR THE CROSS-COUNTRY MARCH.

—MOTOR-BOATING IN COOK INLET

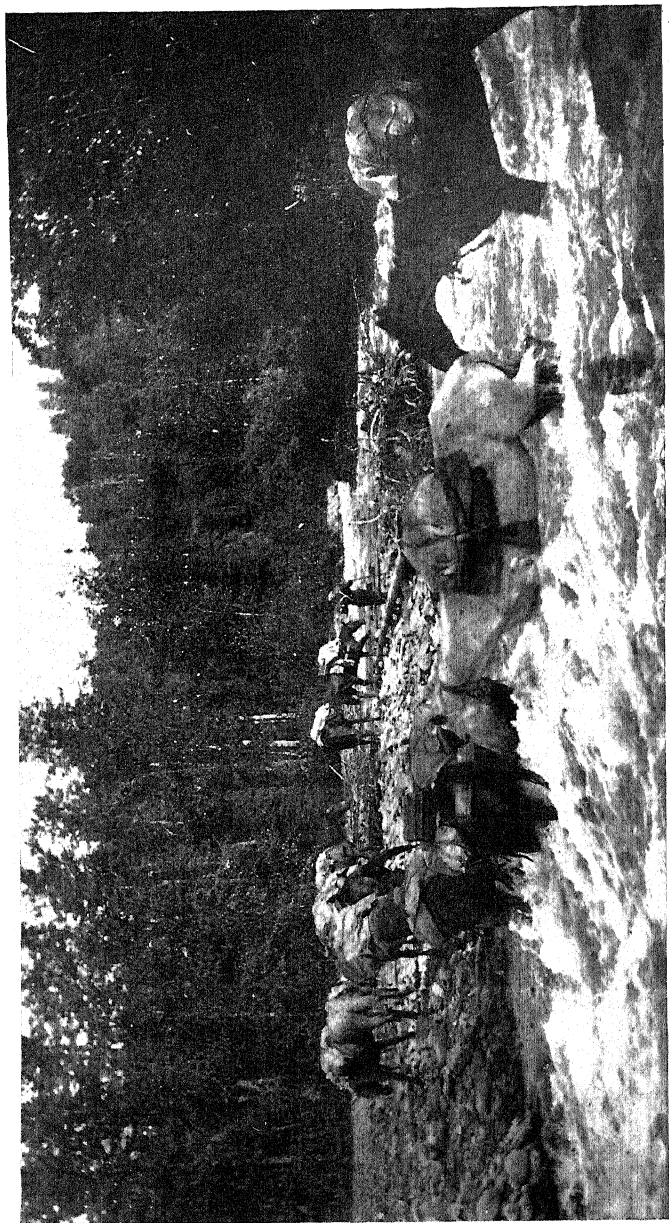
AT ABOUT three o'clock May 30th, as the sun was dashing the Kenai sky with crimson, and the countless dogs began their morning howl, we crawled from the blankets and tumbled out into the frosty air. The scene was superb; the big volcanoes Redoubt and Illiamna, dressed in snowy cloaks of purple blue, belched columns of dark vapour, while the purple waters of the Inlet gently lapping the gravel bars and the sky perfectly clear promised a good day; so leaving Printz, Barrille, and Beecher to corral the horses, while Parker and Ball were to do some unpacking, all others embarked on the launch and turned the screw to kicking us toward Mt. McKinley to transport the first load of supplies up the Susitna River.

The launch had been built in Seattle along lines necessary to cope with the shallow, swift streams rushing down the eastern drainage of Mt. McKinley. She was forty feet long, seven feet wide, with an extreme draft of twenty inches. The model was somewhat after the lines of a Peter-



IN COOK INLET STORMS: THE PERILS OF THE MINERS

This dory with its occupants is believed to have been lost in the gale of August 3, 1906



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HORSES FORDING

Into tumbling glacial streams and through a frigid jungle. In the effort to get to Mt. McKinley we were drenched with ice-water continuously for three months

borough canoe. The power was supplied by a twenty-five horse-power Automarine engine (Lozier) with the propeller in a tunnel. The boat was also fitted for oars and sails. The engine weighed 775 pounds, and the entire boat but three thousand pounds. A river boat on the Susitna needs also to be a good sea boat, for the waters of Cook Inlet are very treacherous. As a powerful river boat and a safe sea craft our launch was a great success.

With the tide running eight miles per hour and the speed of the launch about twelve miles per hour, we rushed up Cook Inlet at a pace that seemed like railroad travel. In less than two hours we reached the head of Cook Inlet and then with a diminished speed we moved over the endless tide flats of the delta, and though the river has a mouth five miles wide we missed the main channels and found ourselves en route for Knick when the tide turned. At last we noticed an opening into the low meadows from the east and following this we ascended the muddy waters still on bars of silt, in water less than three feet deep. We were aground every few minutes and thus drew up water thickened with mud which fouled our check valves and filled the cylinder jackets with clay which soon baked. This was a new trouble for a power launch to contend with and it proved to be our greatest trouble throughout the summer.

With two men sounding we managed to find channels where we were just about able to get

through, but the task was a most difficult one. In about two hours we got into deeper channels, and then it took us four hours more to ascend ten miles against a very swift stream to Susitna Station.

The Station had changed much since our last visit. The Indians had decreased in numbers and pitched their camps near the trading post. Several new log huts were seen scattered among the trees and brush. The town now had a saloon, a trading post, and a roadhouse. Altogether there were about twenty prospectors' shacks and an equal number of Indian camps. The rush for gold toward Mt. McKinley made the Station an important place.

Mr. Frank Churchill, the manager of the trading post, very kindly placed a log cabin at our disposal, into which we placed our boatload of things, and in it also we camped for the night. The next morning at about ten o'clock we were ready to start down-stream, aiming to catch the tide at the mouth of the river at about noon. Having had so much trouble in going aground we decided to add a river pilot to our party. Stephen, the son of the Chief, was secured. He was a trustworthy and intelligent young man who had been in our employ on our previous expedition. Stephen took the helm and guided us very well, jumping tree trunks and gravel bars as occasion demanded. The shore line was rushing past at the rate of fifteen miles an hour and after a half-hour of

Indian pilotage we decided that a better knowledge of power boating was more important than an expert knowledge of the river bottom. So Miller took the wheel. We had much trouble at this time, mostly because the pump was often being fouled by the great quantity of glacial silt suspended in the water. The carbureter, too, was giving trouble because of water in the gasoline, and our downward trip was far from a happy one. Fortunately it was easy for us to ship oars and thus control the boat as she floated down-stream while the engines were being adjusted.

Porter desired to climb Mt. Susitna and Browne volunteered to join the venture. They desired to go light as the launch was expected back in two days, and therefore little food was taken with them when they left us at Alexander, a deserted Indian village. Since we had been much delayed we hastened down-stream to catch the tide by the westerly channel. The boat now ran splendidly, but as we neared the tide-water through the delta we noticed that the tide was already going out fast, but we kept on, our pilot saying it was all right. Passing out of the river and heading past an island upon which a barrel was placed we found the water rather deep, six to eight feet. With the brown water boiling behind us we went along in great glee, but soon after real dangers were at hand. The water shallowed, a heavy sea rolled under the bow, the engine stopped, the boat pounded lightly, we were

aground, and the tide was fast going out. In less than half an hour there were fifty square miles of muddy flats about in place of the chocolate-coloured water. There was no shore-line within five miles of us, nor was there wood or water. We tried the surface water before it left us, and found it drinkable, though salty and thick with mud. We took the precaution to dip up a pail of this before it left us. We drank this water and ate some crackers, then threw out an anchor and without blankets we spread life preservers on the floor and tried to sleep until such time when the tide might return and lift us off.

The night proved dark and the clouds came out of Turnagain Arm with a speed which indicated a blow. We slept little but listened to the roar of the great waves as they neared us. At about twelve o'clock midnight, the boat was afloat and soon after we put on power and headed the swell and the wind. The seas rose and the wind increased and white caps formed on every side. I suggested to our pilot that we make for Fire Island, but Stephen said, "I think all right, river good," from which we understood that he thought a course back into the river and later for Tyonok was all right but that he preferred to return to the river. We didn't like the idea of heading for ten miles of mud flats in the darkness with a howling gale behind us. So I said, "River no good—Tyonok good." He replied with a grunt and some

Indian mutterings which I took to be swear words for the tone in which the utterances came was not indicative of good humour. But for Tyonok we headed. The seas now began to break over the bow and the wind carried the spray into Stephen's face with an ugly force. With each rush of water the boy would grunt and let drop an ugly Indian word. After about a half-hour at the wheel Stephen said "Me plenty sick," and Miller and I might have said "Me too," but we did not confess. We had been nursing the engine, for either the pump or the carbureter was balking frequently. The boat had no ballast and under the violent pitching of the sea we were only able to crawl around in the dark, not daring to light a lantern because we detected gasoline vapours. Miller took the wheel to relieve Stephen and he too got soaked from head to foot in the first few minutes. By two o'clock there was a little burst of light in the east and now we figured we were far enough away from the dangerous shallows to set a course for Tyonok. The altered course brought the seas to our fore quarter but we could not use full power because the boat would hit the seas dangerously hard. Thus we took the seas as easily as possible while the tide carried us southward. By daybreak, about 3:30, we pushed behind the spit at Tyonok, dropped anchor, and blew our fog horn for a boat to take us off. We were hungry, exhausted, and cold, but Prof. Parker had the cook prepare a meal for

us before we got ashore, and food never tasted better.

The six horses which had stampeded were still at large; no trace having been found of them. To make the search more thorough we decided to run the launch fifty or sixty miles south on the next tide and land wherever we could to trail the horses. Ball was sent in saddle along the sandy shore-line, while Printz and Barrille joined me on the launch. As the people of the town were starting their fires we were again on the rough waters. The weather was improving, but Turnagain Arm still had a steel-coloured lustre in its clouds, and vapour plunged into the Inlet, which did not promise good weather; but we were so eager to start the pack train on its long trail overland that we could not afford to wait. We passed in among the big boulders of Trading Bay and noted the dangers at low water. Here the beach is wide and the steep sandy bank three hundred feet high leads to a plain covered by spruce, birch, and cottonwood trees. In this bank in various places we saw thin strata of lignite, a coal in which the fibre and bark of trees are easily made out, but it seems to burn well and is said to be good steaming coal.

The first twenty-five miles of this beach had been searched as we hastened on to Redoubt Bay. Then far out in the mud flats we saw some tracks but after a long search we decided that if the horses were to be found we must seek grassy low-

lands near the point which separates the two bays. Here we met Ball, whose luck was like ours. He had secured no definite trace of the horses. We built a camp-fire and ate lunch, allowed the tide to go out, leaving the launch on the tide flats. Our camp-fire was spread by a sudden gale into a forest fire close to which we tried to keep warm, but the combination of [smoke and wind drove us into the boat for shelter. After the wind subsided we began another search for the horses, but could find no further trace except the tracks which had been followed up to the outer tide flats. Late that night as the tide was about half in we abandoned the horse chase and started for Tyonok. The wind came in gusts and the sea came up in dangerous hills. The night was not dark but the light was of such a quality that we could never be sure of our bearings. The launch laboured heavily in the tumbling seas and we were quickly exhausted, for we had been three days and three nights without proper rest or sleep, and food had been only taken as the conditions permitted. Upper Cook Inlet has no harbours and seeing that the sea was too rough to make Tyonok and get ashore, we ran under a point of land below Tyonok, dropped anchor, and rode out the storm. The sea had broken over the boat so much that the floor and about everything on board was wet, but we spread the life preservers out and on these we slumbered for about two hours. With the change of the tide the sea eased, the wind ceased,

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and a warm sun made the icy volcanoes glitter at six o'clock. On the morning of June 2d we tipped the anchor, headed the tide, and by eight o'clock we were again at Tyonok.

CHAPTER III

THROUGH THE VALLEY OF THE YENTNA.—CLIMBING TUMBLING WATERS IN A MOTOR BOAT

THE programme for our campaign, as it had been formulated to the present, was to explore the head waters of the Yentna River first, and from there we expected to get either by the westerly or an easterly route to the southwest arête of Mt. McKinley. From what we had seen of this area from Mt. Yenlo we had many reasons to suppose that there was an easy pass from the Yentna to the Tonzona. Our efforts were accordingly directed toward the big break in the Alaska Range forming the Yentna Valley. The horses were to go with light packs cross-country to a point at the head of navigation, while the boat with most of our equipment was to go up the Yentna as far as possible.

We decided to spend the day in loading the launch for her second trip up the river and also to help the packers prepare the pack outfit for its great tramp through brush and forest, over marsh and glacial streams.

At about noon June 3d, Printz, Barrille, and Beecher mounted their horses and we turned the

others loose. The train of fourteen horses bounded northward at a rapid pace, only a few of them carrying packs consisting of supplies for thirty days and a folding canvas boat for crossing streams. All the other things were to be carried by the launch to the head waters of the Yentna. It was expected the two horses that had been chased northward would be found along this trail.

As the horses galloped up the beach toward the Beluga River the launch was started in the same direction. The sky was somewhat hazy, but the sea was as smooth as a glacial lake with a glimmering silvery surface. The quiet town of Tyonok with its busy prospectors was soon left behind. The pack train moving at a good pace was seen for some time edging along the great high banks. The boat cut the waters at an astonishing speed and in less than two hours we entered the mouth of the Susitna, a distance of thirty miles, and in another hour we were at Alexander anxiously looking for Porter and Browne who had been awaiting us with empty stomachs and eager eyes. They had known nothing of our horse troubles or the Cook Inlet storms.

Four days had passed since we left them, and after the first two days they began to realise their isolation. With but two days' food they had left the launch to climb Mt. Susitna, and when their task was accomplished the last was eaten and then it was a skirmish for food in a deserted town where but one thin, hungry dog broke the spell



PORTER SKETCHING CONTOURS FROM ABOVE THE CLOUDS



BROWNE



RACONVENZE

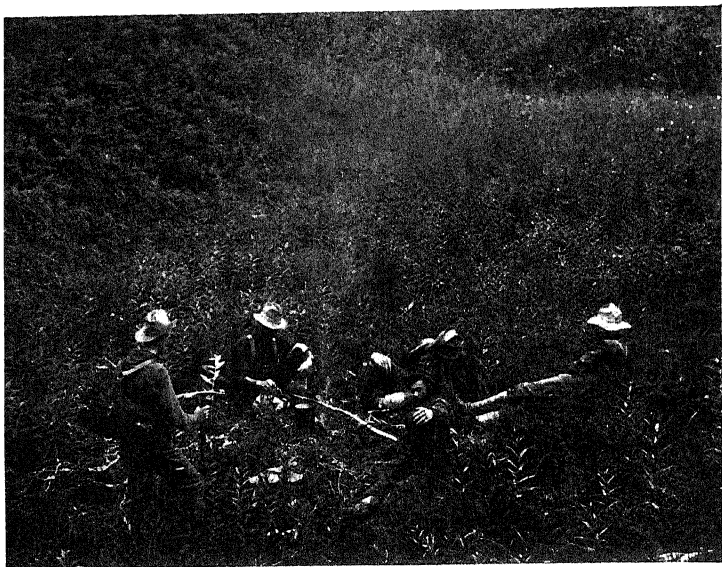


BEECHER

PARKER

PRINTZ

BARRILLE



BREWING TEA IN FIELDS OF WILD FLOWERS



SUB-ARCTIC POND LILIES

of loneliness. Hulligans, a kind of small fish, were coming up stream in great numbers, and in an old house some oats belonging to the Alaskan Central Railroad were discovered. The oats and the fish prepared with a hungry man's ingenuity made luxurious food for two days. But then it seemed as if they might be obliged to stay weeks, and the oats and fish diet did not seem a cheerful prospect. However, they occupied themselves sketching the local bits of nature, and when the launch puffed up the river a heavy weight of distress vanished.

We ate lunch at Alexander and then headed up the swift current for the Station. The weather was such that only now and again did we see the bald top of Mt. Susitna with its long tongues of winter snow still resisting the summer heat.

Mt. Susitna is an important landmark. In clear weather we seldom lost sight of it within a range of fifty miles from either side. With easy slopes the mountain rises out of a low, marshy country to an altitude of four thousand four hundred feet about fifteen miles above the mouth of the river. In its summit there are said to be copper deposits. At its base is the little town of Alexander with a shifting Indian population, getting its subsistence from the run of salmon and trout.

The run of the hulligans proved very exciting. We noted a ripple close to the shore and soon discovered that the dash of water was produced by a small fish about seven or eight inches long.

We followed them mile after mile expecting to pass the excited train, but it was a continuous performance, they first rushed over and under roots, through submerged brush, up into the air, and down with a splash, always seeming to race with the launch. Mr. Porter's thoughts ran to mathematics; he figured that the train of hulligans was twelve inches wide and six inches deep and that it probably extended a hundred miles. Estimating the number of fish in a cubic foot at ninety-one and one half, he went on to so many millions that he gave it up, suggesting that we try and catch some. The launch was run close to shore, and its speed reduced to about that of the fish, then Porter, Parker, and Miller grabbed pell-mell, bringing up handfuls of wriggling, silvery creatures, until the floor of the boat was alive with the catch. Browne was asleep in the stern while all this excitement was making the air hilarious. He was the accredited naturalist, and it was thought that he should join the sport. It occurred to some one that the fish should wake him; and at once his blankets were alive with them; he awoke with a start and struck out as if to swim, believing himself in water, which shows that a man's notion of fish and the sense of swimming are closely associated.

The launch under full power threw up the muddy spume in angry whirls and pushed forward with a force inconceivable against rushing waters. In six hours' actual running time we reached the

Station, beating all records for boats of all kinds on the same run. The prospectors coming over the route regard it as good luck if they can pull or pole or push their boats up this stream in six days. Here with the kind permission of Mr. Churchill we again camped for the night in his log cabin.

In our excitement after hulligans we jumped a log, bent a blade of the propeller, and twisted the rudder. Browne volunteered to fix the rudder, but the task proved disheartening. To take it out he found it necessary to get into the icy waters to his waist, and to replace it he was compelled to get under the boat. With a spirit not discouraged by glacial waters, the thing was fixed, at no expense, with two baths thrown in.

We blew our horn early on the morning of June 4th, to assemble for a start at nine o'clock. The Indians, the prospectors, and hangers-on at the Station came out to see the boat take the stream. About three hundred yards above the Station the river narrows and turns, shooting the waters past a huge bluff with a dangerous swiftness. No boat heretofore had been able to stem this current. In one way or another they have been compelled to seek a roundabout way, but our reputation had gone before us and would we try it? We had so far been able to negotiate all rapids and this did not seem much worse than others which we had made, so we said "Yes, we will try."

Over-confident of our success we put on the switch and were off, but somehow we did not rush into the current in the usual way, but we went on. As we neared the bluff Browne boldly headed for the swiftest water, it shot over the bow and down stream we went. Pushing into the eddy at the Station ashamed of our performance we threw over a line and the people ashore were good enough not to make amusing capital out of our failure. We examined the engine carefully to discover the reason for the lack of power and soon found that the clutch was slipping, and that the propeller was fouled by small sticks in the tunnel. The propeller was reversed a few times, the sticks drifted away, then everything was carefully adjusted for our second effort, the explosions came full and free, the boat quivered with its usual life, and this time all of the town moved up to the higher banks to see our battle with the rushing waters. Browne kept the split between the eddy and the current until about two hundred feet from the bluff and then heading out slowly, the rushing waters flushed the decks and threw the boat far out into the gurgling stream, but the launch kept going up stream—our reputation was now redeemed and we were permitted the favourable prognostication of the sourdoughs.

The Yentna pours its silt-laden waters into the Susitna about two miles above the Station. It drains the great area from Mt. Spur to Mt. Foraker and it is the last of the great river beds

to attract attention as a placer gold-field. The launch pushed up this stream with greater ease than up the Susitna. The rapids were less treacherous, and the waters are mostly crowded into one main channel. During most of the day we pressed along low banks thickly covered with alders, willows, and cottonwoods, but in the afternoon the banks rose, spruce trees were more in evidence, and here we saw the sticks of old Indian camps, also many signs of miners' camps.

At about four o'clock the low clouds which hung over us for several days lifted, and, looking backward, Porter located Mt. Susitna. We had gone about twenty-five miles against a six-mile current. The trip had been delightful and not at all fatiguing, but a bluff coming in sight, and the topographer desiring some observations from it of Mt. Susitna, we decided to land and enjoy our first real wilderness camp.

It was one of the most impressive spots on the Yentna. The river was about seven hundred feet wide and plunged into a deep gorge below, while above to the west were steep banks crested by spruce and birch. To the east were islands covered with cottonwoods, alders, and willows separated by sluggish slews which formed a part of the delta of the Kahilitna. The launch was tied to a tree, and the camp equipment was quickly passed out. Parker discovered that some one had preceded us and had cut wood. Browne and Miller soon had a cheerful camp-fire under a big birch tree,

flour was mixed in the prospectors' pan, and out of the reflector in a few minutes we took twenty brown biscuits; this with bacon, potatoes, and tea completed our bill of fare.

In our rambles about camp we discovered a log cabin on the bluff and a good trail to it. There were differences of opinion as to a choice of sleeping places, some preferred the boat, others the log cabin, and still others a small tent under a spruce tree. The mosquitoes were just beginning to be active, and we anticipated a mild first assault, but they quickly surrounded us in countless millions, driving us to despair with a song and a sting that made the camp ring with sulphurous words. Here were all the varieties of insect life suddenly released from their dormant state, most of them seeking the first blood, and under our thin skins they found what was to their liking. We tried mosquito dope, gasoline, coal oil, creosote, and other things but all to no avail. From this time until we were well up in the snow line these little pests were to us deadly enemies and they were never idle.

The sun sank under the cones of the spruce and left a glitter of gold on the glossy brown waters. Mt. Susitna was clear cut against a purple sky. The rushing waters, the crackling fire, and the forest noises were keyed to a harmonious pitch, but the 'skeets coming in black swarms out of the grass kept us in a perpetual torment. There was a bright twilight through the night, so bright that

we could read ordinary print in our silk tents at midnight. Early in the morning a very heavy shower of rain stilled the mosquitoes but made all the camp thoroughly uncomfortable.

On the morning of June 6th the dark rain-clouds separated, and for a brief period there were spots of sunlight floating down the river. Shivering around the camp-fire we took up the momentous question of christening the boat. The discussion was rather heated in its first stages and the names advocated were *Bolshoy*, the Russian and Indian name of the McKinley group of mountains; *Tyone*, Indian for Chieftain; *Tyonet*, Indian for the king Salmon; also *Yenlo*, *Yentna*; *Mountaineer*, *Yellow Peril*, and *Come-and-Get-It*. After due discussion the vote was unanimous for *Bolshoy*.

At 7 o'clock we slipped the rope and pushed up stream. Browne and Miller took turns at the wheel while Parker did the soundings. Porter arranged the kitchen box on the stern and from there, undisturbed by the excitement of navigation, he took his angles with the prismatic compass thus plotting the river and its banks as we went along. But above all, what interested us forward was the calm pleasure which was pictured on Porter's face as the launch with sharp bounds rushed over swift waters and brought to his gaze a changing and highly coloured landscape. To myself fell the peculiar task of posing as captain and acting as engineer. To be captain was easy, for my crew were good river men, but my duties as

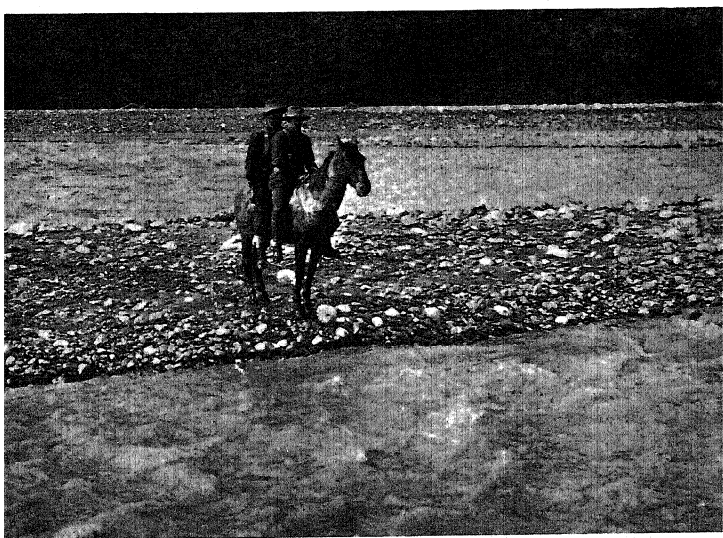
engineer necessitated a careful watch upon the many phases of gas-engine operation. By making slight adjustments, however, the engines puffed away hour after hour with the ease and regularity of clock movements. Each hour we were climbing up stream a distance which it would take a river dory several days to accomplish.

The scenic effect improved as we rose. During the second day from the Station Mts. Yenlo and Kliskon rose into view. Over the lower sky line of the spruce and birch trees, we now noted the foothills of the Alaska Range, but the great central uplift was still veiled by dark clouds. On this day also we passed nearly all of the large tributaries of the Yentna. One, the Kahilitna, a glacial river taking the drainage of a huge glacier from Mt. Foraker, runs through the centre of the new gold country south of Mt. McKinley. Eight miles above the Kahilitna we passed Lake Creek, arising from a large lake south of Mt. Russell. Twelve miles above this we passed the mouth of the Skwentna coming from the glaciers amid the unknown mountains north of Mt. Spur, and early on the morning of June 7th we passed the mouth of the Kichatna which drains the Simpson Pass district. After ascending beyond these four tributaries the Yentna was still as large as the Hudson above tide water, and its waters poured over gravel bars at the rate of nearly seven miles per hour.

We followed the Yentna in its great sweeps and



FORDING THE YENTNA



READY FOR A PLUNGE



curves over a wide expanse of silt. This silt was washed out of the high mountains of the north in former ages, and to-day the same silt, though covered by forests, is being cut away and deposited into other places lower down. The quantity of this glacial wash held in suspension is inconceivable. In places where the current is rapid the consistency of the water approaches that of syrup. This peculiar faculty of the Yentna in tearing down and building up explains the very frequent changes in the channel of the stream. It explains also the origin of the many islands and slews so characteristic of the Alaskan glacial rivers.

Youngstown, a kind of mythical miners' camp, the supposed head of navigation, was our ultimate destination. But we were a long time locating the town. Indeed the town was unable to locate itself, for it drifted with a shifting population of miners. At about ten o'clock we saw a big dory drifting down the stream. A corpulent miner with all kinds of things was in the boat. To our question, "How far to Youngstown?" he answered: "It used to be twenty miles above, but it just moved. I have the town in the dory and am taking it down the stream." He also said the river was not navigable above, but our soundings gave from three to four feet of water, and so long as we could find thirty inches, our boat could kick along.

By going aground often, jumping snags and dodging sweepers, we managed to get to a point

on the west fork about forty miles from the head waters. Here we secured the *Bolshoy* to a cut bank, built a cache, placing in it most of our provisions, and on the bars we erected a big tent.

The tent and its surroundings we named "Parker House" in honour of our co-worker Prof. Parker. The river above Parker House spread over a wide expanse of quicksand. This shallow rift extended about three miles, and beyond the river narrowed and would have been navigable for several miles had we been able to get our boat above the shallow.

A huge camp-fire was built for comfort, and another fire for cooking. We gathered around the fires and talked about our luck in climbing the rushing waters, our picturesque surroundings, the signs of game, and the next effort to find a pass through the range. The work of the day had been exciting. We were tired, cold, and hungry. Nearly everybody helped the cook to prepare a great feast. The menu in preparation was as follows: Biscuits baked in the reflector, with a Yentna gold and brown finish, pork and beans, fried bacon, fried eggs, mashed potatoes, tea. As this was about ready Browne introduced the call "Come and get it." This was continued as a meal call during all of our adventures.

CHAPTER IV

DISCOVERIES ABOUT MT. DALL AND THE YENTNA HEADWATERS.

WE HAD hardly finished the meal when we noted a rather strong icy wind blowing from the north, and with it the clouds drifting up the valley vanished. These vapours in our trip up the Yentna obscured the big mountains of the Alaska Range. Soon after the high clouds also withdrew, leaving a central zone of stratus films. Above this line of clouds we were suddenly surprised by the mirage of peak after peak of giant proportions, all seemingly near and looming up so very high that any one of them could have been mistaken for Mt. McKinley. Below, were the steep green slopes of the foothills, separated by large rounded valleys, in several of which could be seen the blue surfaces of great ice streams, from which came the brown waters of the Yentna. There were four notable peaks after the mirage had disappeared. These were Mts. McKinley Foraker, Russell, and Dall. All were freshly covered with snow, but Mt. Russell seemed most remarkable because of its nearness and regular pyramidal shape. To the westward of Mt. Dall

we were now able to pick out several distinct breaks in the range, and to explore these to discover a pass to the westward was our next effort. On the afternoon of the same day, June 9th, we determined to start for the Pass. We estimated that we were forty miles from the divide, and we planned to cover as much of this as possible by poling or lining a twenty-foot canvas boat. Stocking our boat with a supply for five men for ten days we left Parker House in charge of Prof. Parker and began the arduous and dangerous task of pushing up the tumbling waters of the Yentna. Prof. Parker was to make a round of observations and direct the building and stocking of a large main cache. Mr. Porter had already measured the base line, and had also secured meridian and latitude observations. The topographer was thus in a favourable position to begin a plane-table survey of the unexplored territory through which we were about to travel. My companions in this scouting party were Porter, Browne, Miller, and Armstrong, the latter having joined us on the river to prospect the new territory through which we aimed to go. The boat was not heavily loaded but it gave us much trouble in towing, and we soon discovered that for glacial rapids a canvas canoe was a failure. With four men on the line and one in the stern with a steering paddle we just managed to get along about a mile an hour. Our troubles were numerous, being frequently mired in quick-sand, stumbling over treacherous drift wood

into deep icy waters, fording rapids, and fighting the mosquitoes, were but a few of our hardships. The thing was however exciting, and was taken with good cheer.

As the sun settled under the snow peaks of the west we witnessed the first of the remarkable series of sunsets which gladdened our hearts for weeks to come. We were approaching the time of the longest day and also nearing the arctic circle, the combined effect of which was to give us a long day of intense heat with frequent showers, a short night, frosty and clear with the sun just under the northern mountains throwing flames of orange and gold against a sky of purple. We camped that night on a bar where driftwood was plentiful, and in a near-by pool clear water was found which was a discovery indeed, for though water was to be found everywhere, clear water, free of glacial mud, was indeed rare.

As the chill and twilight of the night settled over us the bright camp-fire was doubly appreciated. A bit of canvas was spread on the sand in the lee of a log and upon it in an appetising array were steaming beans and bacon, bread, and tea made of clear water for all to "come and get it." Our clothing was soaked with ice water from head to foot, and until the cheer of the fire and the thought of hot food were impressed upon us we were thoroughly miserable. That night in the silk tents we were well housed from the mosquitoes, and in the morning as we awoke among the roaring

ice waters, the camp-fire and the warm breakfast proved a fetching inducement for early rising.

By noon of the 10th we reached the limit of profitable canoe navigation. The boat had been dragged over gravel bars so much that the outer canvas was worn through in several places, requiring immediate repair. We were now about eight miles above Parker House, and here the river makes a sharp turn. Leaving Miller and Armstrong here to repair the boat and prospect for gold, Porter and Browne joined me on a venture to seek a pass. The outlook from here was favourable. Winds and clouds were rushing into gaps through the mountains at a point about thirty miles westward. To reach and examine these gaps we packed into our rucksacks our equipment of sleeping bags, tent, food for seven days, and instruments, in all weighing thirty pounds. Starting late in the afternoon of the 10th we set a course into the narrowing valley of the west fork of the Yentna travelling over gravel bars and benches, fording slews occasionally, but no big streams. The frequent stops which Porter required to set up his plane table gave us a welcome breathing spell. The tracks of bears, moose, and wolves aroused us to a spirit of the chase, while the bewildering mountain slope with roaring falls and cataracts echoing from side to side revealed nature in its wildest aspects.

After having covered about seven miles we spent the night in our little tents pitched on

a sand bar, and before the sun had dispelled the chilly shadows of the big mountain of the north-east we were again on the march with our packs. At noon we found the sun so hot that it was thought best to camp for a few hours to rest, to dry out our clothing, and to eat a hearty meal. We had crossed and recrossed the main stream with great difficulty. The icy waters were here wide and deep, but the shores were so precipitous, and the underbrush so dense that we were compelled to take the river bottom, fording and swimming as the occasion required.

At four o'clock in the afternoon we again took up our burden and marched into the opening of a canyon, but the waters here proved too deep and too swift to ford. After vainly searching for an easy crossing we were finally forced to camp, having made only ten miles for the day's effort.

We took to the brush on the next day to avoid fording and swimming. The stream was very dangerous, the alders the worst we had seen, and though we found an old bear trail it took us all day to make an advance of three miles.

Early on the morning of the 14th it rained heavily in the mountains. The river was high, but we could not afford the time to wait for better weather. Our first task was to cross a stream, the worst that we had seen. We tried in vain for a good ford and at last Browne in a desperate spirit plunged into the raging torrent, lost his footing,

turned several summersaults, was carried down stream some distance, and only saved himself by landing on a submerged boulder. Porter and I followed with better luck, but it was agreed that we would cross no more such streams. We tried hard to be true to our resolution, but other streams barred our way and must be negotiated. In four hours we had gone about eight miles and were blocked from farther progress by rapids increasing in force and depth. We calculated that with horses all these waters would be easy, so it simply remained for us to explore the pass far enough to be reasonably sure that we could get through the range. To determine this point finally we now decided to climb the mountains to the south to an altitude where we might see through the range. We crossed a deep channel and began the climb wet to our hips, with boots full of ice water. The slopes were steep, while the underbrush was as dense as tropical verdure, and on hands and knees we climbed and crawled between branches. The mosquitoes were maddening, and the devil-clubs filled our clothing with needles. Before we had ascended two thousand feet our trousers were torn in strips and we were thoroughly exhausted. A rest of an hour while observations were being made and another hour for lunch changed our fatigue into renewed enthusiasm; for at this time we saw that if we could reach an old glacial bench about a thousand feet higher, and about four miles west, we could get a

view which would satisfy us as to the possibility of getting our pack-horses through the range. We reached this position in about two hours, and there pitched the tent. Wood was scarce here, but we found roots, bits of brush, and moss sufficient to prepare our food. We had now reached the limit of time and food-consumption which we had allowed ourselves, so this must be our last day of advance. It rained, snowed, and hailed a great part of the night, but the early morning as usual was bright and clear.

Our position here was unique. The foaming waters of the Yentna were more than two thousand feet below us, rushing from bluff to bluff in a system of unexplored canyons which for perpendicular cliffs and superb mountains of great altitude surpassed the glories of the Grand Canyon of the Colorado. To the south were huge snow-capped mountains unnamed and unexplored, among them large snow basins feeding glaciers of the Yentna and Kuskokwim. To the north was a curious mountain about six thousand feet high with five pinnacles. The main Yentna waters came out of canyons on both sides of this mountain. To the south above the canyon we could see the rolling hills of the western slopes of the range. To the north of this mountain was a wide low gap through which the clouds of the Kuskokwim drifted, and beyond this gap were high mountains leading up to Mt. Dall. The passes existing on both sides of the mountain with five pinnacles seemed promising

from every view we had, but no pass is a pass until some one has passed through it. We could have gone through afoot, but we had neither the time nor the food supply, and, after all, our object was only to ascertain with reasonable possibility if the pass was practicable for pack-horses. Of this we now felt sure, and laboriously returned to Parker House over-confident of our ability to cross the range by the new pass with our horses.

CHAPTER V

INTO THE YENTNA CANYONS

WE WERE now waiting for the arrival of the pack-train. Miller and Ball had been sent to the Kichatna to meet the packers and guide them above the timber line, along the bald slopes, and down to our camp in the Yentna. The days of waiting were spent by cutting trail from the river to the grassy upper slopes. Porter and Browne camped high up in the mountains to study topography and game, and had several exciting experiences. Porter took his instruments to the top of a commanding peak and set up his plane table to sketch a round of contours. While his attention was fixed on distant peaks, he was disturbed by the approach of a big brown bear with a cub. There was not room for Porter and the bear on the peak, and Porter had no weapon with which to enforce his prior claim, so he quickly grabbed his instruments and with long strides he descended over the sudden drop of snow-bank. The coming of a violent storm made farther retreat necessary for both Browne and Porter, and the map was never completed.

In the course of a week after our return to the

Parker House we heard one day the sound of the bell-mare's bell and the axes cutting trail through a dense spruce and birch forest, and soon after saw Printz, the chief packer, tumble into a stream from a low bank. The water was deeper than he had calculated, so he had quite a tussle to dodge the horses that plunged in after him. Men and horses scrambled out on a sandy bar, and with them came clouds of mosquitoes. Here these pests greeted us and we greeted our companions from whom we had been separated for three weeks, and the reunion was an occasion for a special feed and rest.

Printz with Barrille and Beecher had had a hard time in the cross-country tramp to reach us at the Parker House, a distance of one hundred and thirty miles, over marshes, through thick underbrush, and across several big glacial rivers. The horses were reduced in numbers, and those that survived were weak, thin, and sickly, due mostly to the incessant torment of mosquitoes and horse-flies. The six horses stampeded by the Indians' dogs were not recovered, and to make matters worse, while feeding near the Beluga River the herd wandered over a grassy plain under which a stratum of lignite coal was burning. Some of the horses broke through the surface and were mired in the fiery coal. Six were badly burned, of which three were shot, but the others after careful nursing recovered. Now there remained but eleven horses of a splendid pack-train of twenty

animals, and some of these were not strong enough to carry packs.

On the 25th of June we packed the horses with supplies which we hoped to place in caches along the western side of the range for later use by our hunting party. We also packed an outfit and supplies for an assault upon Mt. McKinley from the slopes north of Mt. Foraker. The weather had been very warm for several days, melting the winter snows in the high mountains rapidly, and there was also a great deal of rain during the night. The river in consequence was rather high and we could not afford the time to wait for low water, nor could we guess when the water would become low. We started to follow the Yentna into the pass as we had previously gone afoot. We had not gone far before we noticed that the Yentna offered perils even with horses. The pack-train of eleven horses, carrying about one hundred and fifty pounds each, with eight men scattered among them, was in good control. The men and horses rushing over seething rapids into a land unknown made a picture of pioneer life as primitive as that of the early Western frontiersmen.

While the horses were thoroughly trained to carrying pack they had not yet adapted themselves to the new trick of fording rivers with the double load of pack and man. In following the Yentna it was necessary to ford so often that we could not stop and unpack, nor did we aim to trouble the animals except in crossing dangerous

places. As we neared a deep slew each man took his favourite horse and led him into the ford, mounting on the run. This kind of adventure proved very exciting. Most of the horses bucked with the first attempt and plunged into deep swift water with a wild splash. If the swim was short and the rider had good presence of mind the task proved merely exhilarating, but if the swim was long, and either man or horse became panic-stricken, then there was trouble for all.

This panic in the depth of swift water, which is the same as that in the breath of avalanches at high altitudes, is a dangerous state of mind, for it defeats the ability for quick action upon which the security of life often depends. Some men soon school themselves to its elimination, but with others the thing becomes more overwhelming with every experience. Rushing glacial streams have a peculiar effect upon every one is who much around them. There is a run of human passion which goes with tumbling waters. Most of our party felt the spirit of this peril of the rapids, for as we breathed the icy spray of the swift streams some became stimulated and talkative and others quiet and melancholy. Thus each swim of the Yentna left its imprint of intoxication.

In the first three miles the fords were only waist-deep and few men took the trouble to mount, but as the river turned westerly the many slews united, making one large river about three hundred yards wide. Picking what we supposed would

be the best ford, Printz, Browne, and Porter started. They got along splendidly until the horses began to swim and were carried down stream, landing on the opposite shore along a cut bank among roots and fallen trees. The men climbed out, and after a good deal of trouble succeeded in dragging their horses out also. Most of the other horses were bucking and could only be urged into the water with great difficulty. To allow for the drift down stream the rest of us started into the water farther up, with results even more disastrous than the first.

At the next ford we were more careful. A trail was cut for a mile through dense alders and willows, which served the double purpose of obviating a swim and warming the men after their shivering water adventures. Coming out of the jungle we found a camping spot on a bar where driftwood and clear water were abundant, but the grass was insufficient. From the driftwood a big fire was made. Soon we forgot the discomfort of the cold water and warmed to home topics.

During the next day we were able to avoid dangerous fords, and, with an agreeable camp under magnificent cascades, the peril of the rapids was for a time dispelled by the more distant music. The next day, however, troubles returned with double force, for as we pushed into the mountains the river took a zigzag course from bluff to bluff and ruffled up in mid-stream tumbles.

The worst experience of this day and the most dangerous of the entire trip unfortunately fell to the lot of the man who feared the run of glacial waters most. As the river made a sharp turn from cliff to cliff we were forced to cross two narrow slews where the water moved with a rush that made us hold our breaths. In the first crossing nearly every one had got into trouble and scrambled out of the bubbling rapids with the feeling that he had just escaped an icy grave. The next slew was more encouraging. Here it was wider and gave us more room to clear the cliffs if by chance we were taken down stream. Four men crossed with some difficulty, but by just missing a swim. Prof. Parker mounted Billy Buck, the horse that had gained the reputation of being the best river animal. Billy Buck started in somewhat lower than the other horses, became confused in mid-stream, lost his footing, went down stream and under. For a few seconds both the Professor and the horse were out of sight. Suddenly the Professor bobbed up, struck for the shore, and was pulled out by Barrille at a time when he had about given up the game. The head of the horse was seen as the seething waters swept the cliffs, but we followed the stream with anxious eyes for some distance without seeing the unfortunate animal again. We were certain the horse was lost but thought his pack must drift ashore somewhere. In the pack were a number of things indispensable to our work, but the thing desired most was

Browne's rifle, which was lashed insecurely over it. Two scouting parties were sent down stream to seek the pack, and a few miles below they found Billy Buck feeding along in tall grass, with his pack still properly balanced and the rifle somewhat scratched and dented but still in working order.

The unexpected rescue of Billy Buck made our camp ring with enthusiasm, but the day's experience, with the narrow escape of Parker, proved that greater caution was necessary in the future fords. Our camp here was near a clear stream, where Porter secured some trout. The foothills rose in successive slants almost perpendicularly. Near the stream bed were a few spruce, birch, and cottonwood trees, and some scattered patches of grass. The middle slopes were covered with alders and the upper benches were remarkable for new green carpets of grass, while just above, at six thousand feet, was the line of perpetual snow.

When the sun broke through the haze and vapour it was suffocatingly hot, but the almost continuous train of clouds which ran through the range in the direction of our prospective pass kept up a gloom of local showers. The nights were bright but chilly, and the winds were unusually strong. The extremes of heat and cold were keenly felt and the difficulties of advance were such that an air of uncertainty and mystery was necessarily cast over every plan of action.

The mouth of the canyon of the Yentna was but eight miles away and the next day's camp was to

be pitched in a bunch of big cottonwoods within easy striking distance of the opening. With good weather and good luck we reached this camp soon after noon.

It was evident that much scouting must be done before a pass could be forced here with heavy packs. A cache was built, a permanent camp was made, and good feeding grounds were sought for the horses.

The morning of June 29th opened with spats of sunlight, which drifted hurriedly along the valley. The temperature was 43° and a strong wind came out of the canyon in hard puffs. The problem of the day was to determine finally the possibility of getting through the range. We entertained strong hopes of doing so, but the canyons were still unexplored, and with our unfortunate water experience we prepared cautiously for the desperate task. Browne, Barrille, and Printz were invited to join me in the endeavour. The four best river horses were selected, and without packs and without saddles we started for the plunges.

Our camp fellows gathered at the gates of the canyon and watched the horses take the first series of rapids. The water was deep and swift, but the swim was very short. As we pushed into the narrowing gap of the cut the streams came together with augmented force. To gain footing on the bars it was necessary to cross at every turn. We had expected to swim much and

therefore wore as little as possible. A bathing suit would have been to our liking, but the icy water and the frost of the shadows in the canyons, with a biting wind, made our wet clothing almost harden to armour plates. After each swim we dismounted, shivered, danced about, and hurried along to the luck of the next crossing.

About two miles up stream the main canyon turned to the north of a remarkable peak with five points. Here the river forked, the northerly stream heading towards the Tonzona River while the southerly stream, with a lesser canyon, led towards the Dillinger River. Both courses must be explored for a pass. Browne and Barrille were sent to examine the Yentna-Dillinger gap, while Printz and the writer sought to push into the Yentna-Tonzona canyon.

Toward the Tonzona the walls of the canyon rose in successive tiers to seven thousand feet. For sheer cliffs and dazzling contrast of colour the scene surpassed that of the Grand Canyon. The gap narrowed as we advanced, the stream deepened until at last three miles above the forks we were halted by the plunging torrent with no place for a footing for man or beast. We found some tracks of moose, bear, and mountain sheep, but the footing was too insecure for our horses. With no safe practical way to get through this canyon we returned to the forks and followed Browne and Barrille into the other canyon, westward to the limit of horse travel. This canyon was less

picturesque, but it offered better facilities for travel. To each side of the canyon there was a bench, the shelf of an old glacier, beyond which we saw a rolling grassy country at an altitude of about three thousand feet. It was, however, impossible to rise out of the canyon with our horses to this bench, and therefore this pass would also be impracticable for the pack-train, though men with light packs could get through. Unless we could push along supplies sufficient for several months it was useless to continue the search for a break through the range, and therefore we abandoned the pass-seeking undertaking.

The return proved to be a very dangerous adventure. The sun had thrown its fire on the glacier all day, and the river swelled with leaps and bounds. We had no great difficulty until after we passed the forks; then the horses refused to take to the water. Printz made seven or eight attempts with his Billy Buck, and each time the horse turned to the near bank. In one of these attempts my Roan followed, struck out with a desperate lunge, and crossed. This left a wide torrent between us, and the noise of the rushing water was such that we could not hear each other. After several more attempts Printz took his horse to a break in the canyon and signalled that he would try to return along the brim.

There were still five dangerous crossings to be made before leaving the canyon, and to do this alone was taking a desperate chance, but there

was no alternative. The next crossing was accomplished without much trouble, though Roan refused for a long time to make the attempt, but the next swim induced me to quit water ventures for that day. In urging the horse into the water he suddenly lost footing and struck out, but the current was such that he turned over so quickly that he hardly knew what happened, and I had no time to argue either with Roan or myself when I found myself groping at the horse's stomach with his legs dashing out with wild darts. I let go; whether I prudently decided to quit the horse or unconsciously let go I do not know, but the next moment we were side by side, snorting and puffing and reaching out for the shore.

Roan was carried down only about one hundred feet, and then reached out over big boulders to a sand bar, where he stood and watched me drift with the rushing waters toward a cliff. It seemed as if I could never reach that shore, and as I was about to seek the bottom the stream brushed the rocks with such force that it was impossible to hold the feet down. Feeling that the grip of death was at hand a last effort was made, which landed me on the boulders as the current turned to press into a tunnel. For some minutes I remained face down on those boulders, so nearly paralyzed from cold and exhaustion that I was unable to stir. With increased consciousness there was also an added sense of cold, and as I

walked over to the horse I noticed that he too was shivering. It was but a mile to the end of the canyon, but I had not the courage to test the more dangerous crossings below.

Finding some good grass in a gully I left Roan, intending to reach camp over the brim and expecting to come after him in the morning, when the river would be lower. The ascent out of the canyon was a very difficult one, but I had not gone far before the horse pushed his nose under my arm and proved that he could climb as well as a man. Together we made a zigzag course to the top, but there our trouble was even worse. The brush was so thick that it was difficult to push through, and I had nothing but a pocket knife with which to cut a trail. Crowding between alders the horse followed, seeming to share with me the eagerness to get away from the rapids. Finally we reached camp, where we found Printz against a blazing camp-fire thawing out. Browne came along about an hour later having shot a brown bear, and having had the same experience which fell to our lot, but Barrille with his horse was left in the canyon.

An expedition was organised for the relief of Barrille with other horses and ropes, but he refused to be rescued that night while the water continued to rise, and the temperature lowered, and asked to be left until low water in the morning. As the sun rose Printz took Roan and went to the relief of Barrille. The water was so low that both were able to ride on one horse without swim-

ming. Barille had been twenty-four hours without food or sleep but he had a well-rounded experience.

Our adventures in the canyons proved that a farther effort to cross the range here with supplies was hopeless. There still remained a glacier leading to Mt. Dall along which there appeared to be a break through the range, but this was not practicable with horses, and therefore of no use to us.

We returned to Parker House to devise some other line of attack. The pass-seeking adventure was a hopeless failure, but the many discoveries of glaciers, mountains, and rivers were sufficient reward for the hard experiences.

CHAPTER VI

NORTHWARD TO MT. MCKINLEY OVER NEW GOLD DIGGINGS

FAILING to force the Yentna Pass our next route to the west was along the Kichatna and through Simpson Pass. But before such an attempt could be made the horses must feed up and be allowed time to recuperate. The long drive overland from Tyonok and the hard life in the Yentna with very little grass all along so reduced the pack train that the animals were unable to assume the hardships of the mosquito-pestered Kichatna. There were three arguments which induced us to try a reconnoissance northward to Mt. McKinley. In prospect it did not seem a difficult horse trail, and food was abundant. Therefore the horses would rest and regain strength for the more serious effort later to the west. The country over which we were to travel was the new dreamland of the prospector, and our exploration of it would give a map of what was a blank on the charts, and above all it was the most direct route to the base of Mt. McKinley, a distance of seventy miles.

With these points in view we refitted from

Parker House for a month's campaign. From the highlands to the west of the Yentna we had previously picked a trail for the first stage of this journey. Between the two forks we must cross five miles of jungle, then cross the east fork of the Yentna, and ascend Mt. Kliskon. To cut trail Browne, Printz, and Miller were sent out early in the morning of July 3d. The pack train followed in the afternoon. The water was high and we had still to cross several deep streams of the west fork, in each of which we got thoroughly drenched. In the jungle over the newly made trail travelling was at first good. There were large spruce, birch, and cottonwood trees and a dense underbrush of willows and alders. Now again we rose and to a hill where the light fell through the narrow gap between the trees and illuminated luxurious grass fields to which the horses ran with delight. Around some erratic boulders we found wild currants and cranberries. Squirrels and fool-hens made the air ring with a note of life, while bear trails and moose tracks kept the nimrods keyed up to a pitch of excitement, but we were too busy to hunt.

We had counted on crossing this neck of land in a few hours but we were misled. Our bird's-eye view from above indicated a soft green wilderness with a decorative park-like grouping of the spruce, the alders, and the cottonwoods. There were many deep slews and marshes which we did not see until we plunged in muddy waters. Finally as the chill of night increased and the song of the mos-

quitos saddened, we were confronted by a deep stream with cut banks on both sides, which we could not cross. We camped on the bank of the slew, and before morning the stream rose and the whole jungle seemed to be afloat.

In the pouring rain we started to find some ford but we waded for miles through brush and mud without being able to cross. Another slew drove us back until we wearied of doubling upon our back trail. It was an innocent, quiet-appearing band of water not more than one hundred feet wide. In a desperate mood we resolved to cross it. When men slip and stumble over roots and entangling willows in ice water waist deep for hours the thought of a swim comes as a sort of relief. But some of our men could not swim and others who could were so cold that they did not dare to venture.

Two horses voluntarily plunged in, and with loud snorts they struck out for the other shore. The poor creatures with our instruments and matches and sugar and other precious things swam about for a long time before they were able to gain a footing on the opposite shore. Completely exhausted and nearly frozen to death they finally reached bottom in the brush but were unable to drag themselves out of the deep water. In my eagerness to get to these sinking animals I tried to mount my horse without taking off his heavy pack and urged him into the water. He was a good swimmer but objected to being mounted

while carrying a pack saddle. We edged along to find a favourable jumping-off place. Without my consent the horse jumped a fallen tree and bucked me several feet into the air after which I went down to what seemed like several leagues of wetness. When I had a chance to catch my breath I found myself drifting down stream within reach of my struggling horse. Separately we struck out for the other horses in trouble. Browne and Printz felled a tree and managed to cross on it, as did also Prof. Parker, but they sank to their necks before crossing and might have swam over with less discomfort. All the others managed to cross holding to a pack strap or the tail of a horse and made easy work of it. To the other side of the slew we waded through a flooded flat grabbing the limbs of trees, monkey fashion, to keep from having our feet glued to the mud bottom. We all breathed a sigh of relief when we rose on to a ridge where we found a good bear trail going our way. Bears usually went our way but they only came our way when we were unarmed.

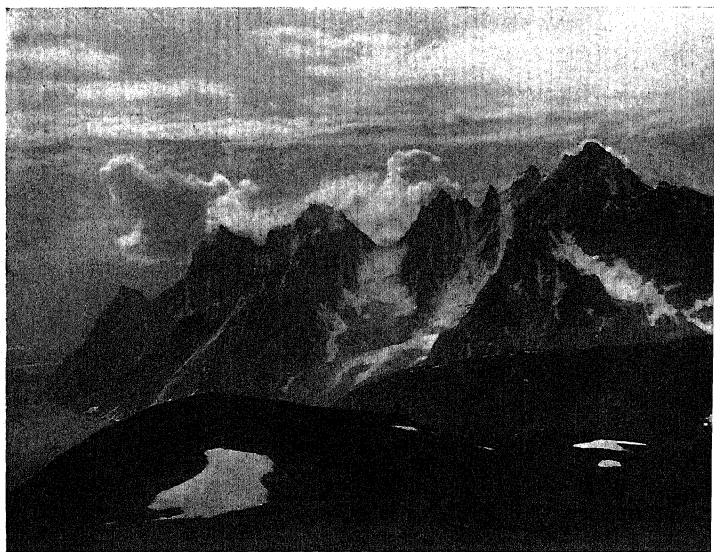
Soon after we saw the beautiful green slopes of Mt. Kliskon and the wide flats of the east fork, and now it remained only for us to find a ford to be able to get up into the mountains and out of this detestable floating lowland with its pests of mosquitoes and its run of icy waters. But the hope of a better country was very slowly realised. Indeed when we did get into the high country we still had water troubles of another kind.

We jumped out of the jungle on to the bars of silt and began to cross the river. We forded for several miles across stream, up and down, taking one slew after another, all over dangerous quicksands, where the horses would mire and tumble and roll amid stream with the packs. The last stream was about five hundred feet wide, very swift and deep. This we could not attempt, reduced as we were by the day's troubles. There was an alluring camping spot about two miles south and to it we betook ourselves over the many slews which we had to cross. From this camp we saw several miners' tents on the other shore. After a rest and a meal we managed to signal to the strangers to bring a boat and ferry us over. The horses without packs were run into the main river and swam splendidly, but they were carried a long way down stream. These tents marked the location of what had been intended as a miners' town, but the east fork was not found to be navigable to that point, and therefore the town moved down stream eight miles.

Rain or storm did not as a rule delay our advance but our next day's march was over the miners' trail, climbing steep slopes through dense underbrush. It rained every day at sometime. During a stay of two days with the miners there was no interruption in the downpour. With swollen mountain torrents and wet brush before us we were forced to await better weather. From the prospectors we gathered that there was a trail for eighteen miles over the mountains to Sun-



MT. DISSTON AND THE GATHERING BASINS EAST



RUTH GLACIER
The Tokosha Mountains

MINER'S MAP OF THE MT. MCKINLEY REGION, ALASKA

by the

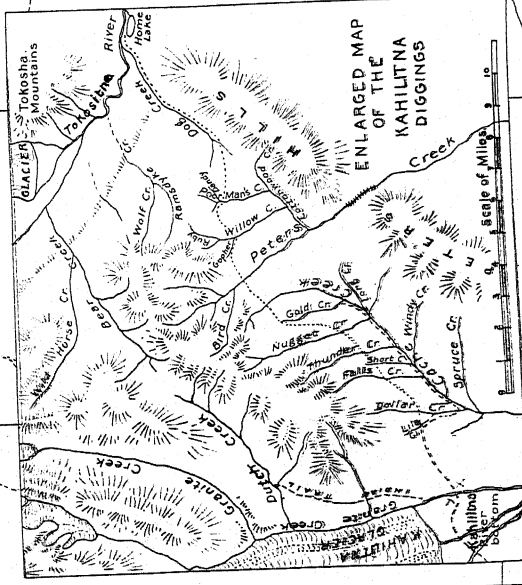
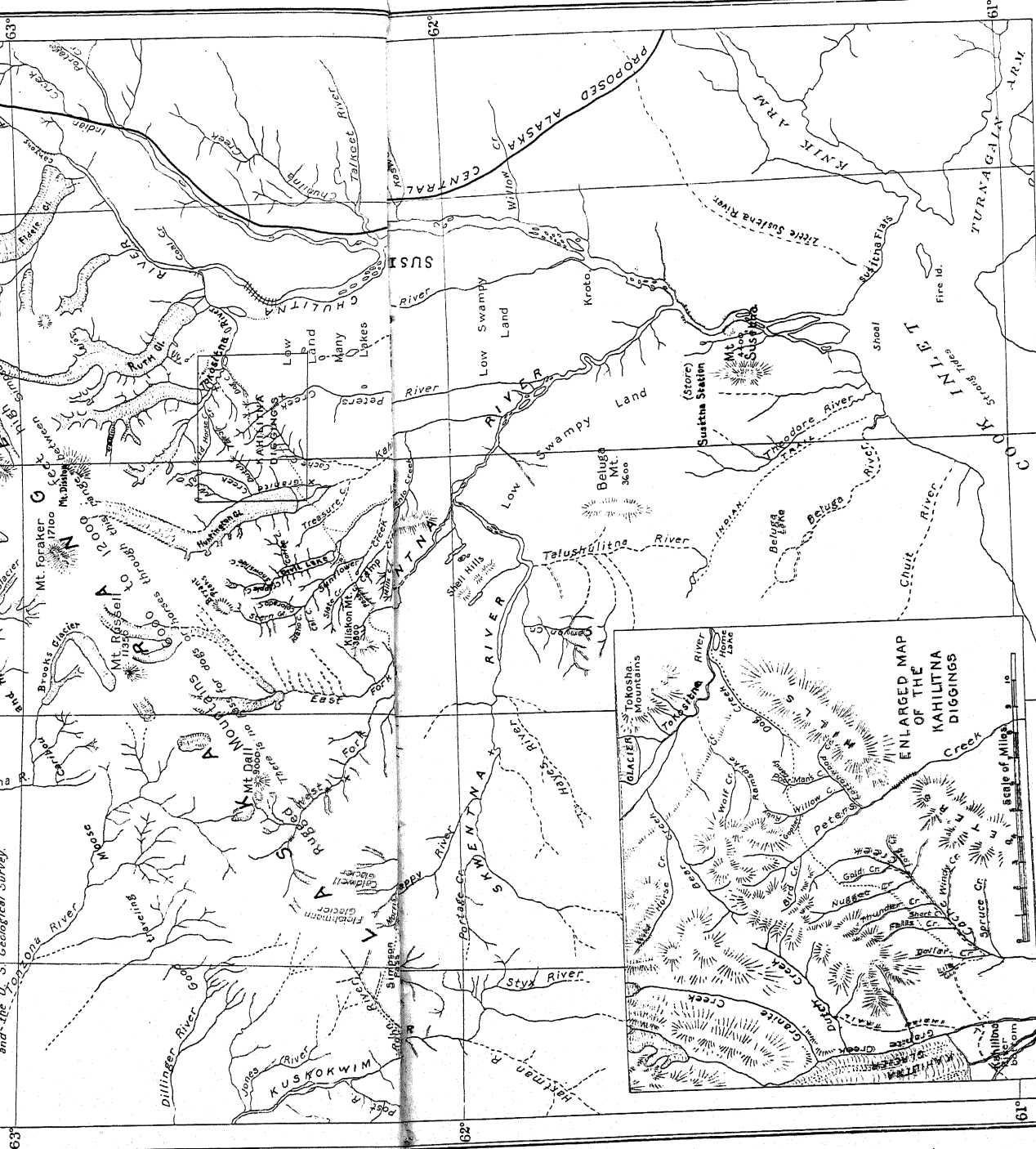
Topographer of the Cook-Mt McKinley Exp'd'n

Scale of land miles 0 10 20 30 miles

1907

Numbers are heights in feet

about sea level. Surveys of Dr. Cook's Expeditions
and the Topographical Survey.



COPYRIGHT 1907 BY F.A. COOK.

153°

152°

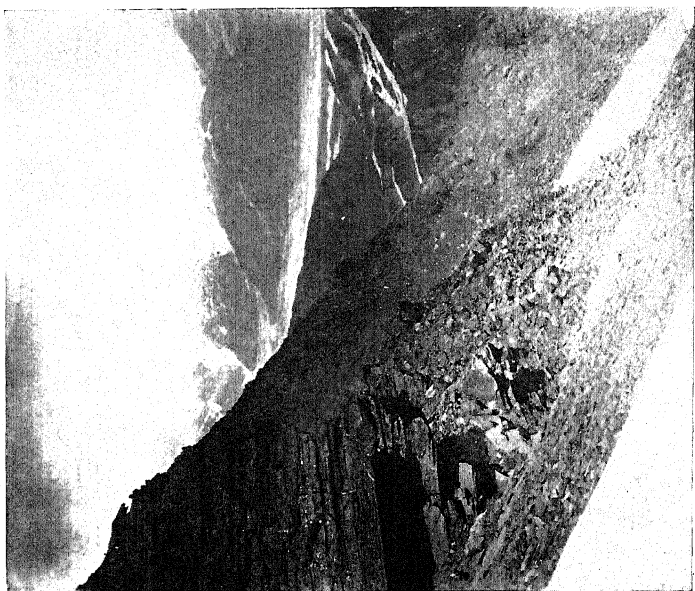
151°

150°

NOTE: Broken lines show about the position of water courses not accurately surveyed. Dotted lines show the location of trails. Canyons are shown thus. Head of oblique lines marked thus, x. Compass needle points about 28 degrees east of north.

CUT OUT THIS SCALE AND USE IT TO MEASURE OFF YOUR DISTANCES ON THE LARGE MAP

Scale of Miles 0 10 20 30 miles



WYCKOFF GLACIER



A TROUT STREAM

flower, a miners' camp and beyond the country was said to be possible everywhere for horses.

We packed our horses on the morning of the 7th for the climb of Mt. Kliskon. It was still raining, but in the course of an hour the rain stopped, the air thickened, and a wet dew blackened the day. As we edged along a roaring mountain torrent, cold whiffs of wind brushed the jungle and flooded us with a freezing drip. The ground was soft and little angry streams rushed at us from every ledge. The horses after their long rest set up a lively gait but soon the feeble animals fell back and before rising out of the timber line they were exhausted. Two sorrels rolled down hill for several hundred feet with their packs. We gathered up the bags and again put on the diamond hitch but both animals collapsed. The horses' packs were then removed, and the train moved along up a steep incline through grass six feet high to a camping place under the birch trees along the edge of the tree line.

It was about noon when we camped. The freezing wind eased, the sky cleared, and a bright warm sun soon changed the shivering atmosphere into one of surprising warmth and scenic grandeur. The gap through the Yentna canyons was choked by clouds bunched tightly and hurrying rapidly to the west. The great winding bed of the Yentna visible for fifty miles was marked by a wide zone of trees and above were extensive meadows of tall grass running to mosses and lichens and snowy

peaks. The horses sank in the grass grunting with a joy of fulness. The men stretched lines around twin camp-fires and dried out their clothing which had been wet for weeks. With a fill of bacon and beans, rice and curry, and beautifully browned biscuits, all around the soft blazes of a birch camp-fire, with a superb outlook, the tormenting rapids with their frigid perils were left far behind. Life had indeed for us a new aspect.

It rained most of the night and in the morning we were pelted with hail. Good weather does come occasionally but like the gold it is found in small bits. Our prospective route from here was along easy grassy slopes, around bunches of alders into a saddle. With bright hopes we packed for Sunflower. Local showers flushed us as we rose but these did not bother us as much as did the increasing pools in the muskeg. We naturally supposed that as we got to the top of the mountain the water and mosquitoes which followed us everywhere through the low country would leave us, but not so, it was water everywhere with an increasing sacrifice of blood for the omnipresent insects.

For mountaineering in Alaska one requires a good deal of dexterity in dodging water. Along the sea level the waters have an inconvenient way of tumbling over you unexpectedly, and one looks forward with delight to the time when in ascending rivers the wind-pitched swell of the ocean can do no harm. On the rivers one gets entangled in

snags and goes aground so often that it becomes a constant swim to keep the boat afloat. Leaving the river bed one plunges into a dripping underbrush and gets a shower bath with shivers compared to which swimming glacial streams is easy. Beyond the forest and the brush we break through beautiful carpets of moss into water and mud, waist deep. Rising out of the floating lowlands into the magnificently painted uplands we prepare for the luxury of dry feet. The camp-fire is built, we dry out, scrape off the accumulation of mud, and continue our ascent into the hills, but the water follows us. It spouts out of the side hill, it shoots over the rocks, it oozes from everywhere. On the top of the mountain we fall into it. Along the rivers far below we were forced to climb trees to get out of the water. In coming up it rushed out at us. On the top it bubbled up at us. Even above the clouds we did not get away from the water, for then snow fell on us from a clear sky. Water from below, water from above, water everywhere. To climb Alaskan mountains we should be web footed and duck-feathered and wing-finned like the penguin.

During this amphibious climbing several horses failed and we were again forced to carry their packs after a half day's travel. Camp was pitched in the saddle on a little dome which sloped to quivering marshes. Around a carefully nursed miniature fire of green willows we tried to absorb hard-earned comfort. To the north was the snow-streaked

summit of Mt. Kliskon, and from one of its glacial worn shoulders we hoped to get a look at Mt. McKinley, with a peep into the run of troubles before us for the next few days. The tents were pinned down on the hummocky muskeg, and on it we folded ourselves like pocket-knives to fit the particular ditch which fell to our lot. It rained most of the night, and the hills, only a few hundred feet above, were blanketed with fresh snow. As we crawled out of the tent to straighten out the kinks in our twisted bodies we saw the horses leisurely browsing in new spots of green, where the winter snow had but recently melted. The air was flavoured with a wintry bitterness, but the following clouds and the crimson sunbursts indicated better weather. A day of rest was declared for the horses while we scattered to explore the country about. Parker and Browne climbed to the summit of Mt. Kliskon. Porter and Barrille moved from peak to peak to make a topographic outline. With Miller and Beecher I prepared to climb the nearest peak to plan our future movement. We ascended the most northerly peak over easy grassy slopes to its summit. The altitude was 3500 feet. It had rained and hailed during the night, but the day was clear with a cold wind driving out of a northern snow field. To the west the view was obscured by other peaks. To the north and east there was an unobstructed spread of scenic surprises.

The three greatest peaks of the Alaska Range, Mts. Russell, Foraker, and McKinley rose out of a

wild maze of peaks and gaps. The middle slopes were being swept by a few clouds which gave the peaks an unnatural height. About Mt. Russell we noted high snow fields and to the east of Mt. Foraker a wide open space which we took to be the gathering basin of the glaciers since given the names of Yentna and Huntington. There was what appeared to be a southeasterly ridge extending from the easy upper slopes of Mt. McKinley which interested us very much, but this later proved to be an optical illusion, for instead of a continuous ridge it was a line of peaks including Mt. Disston, all separated by narrow canyons. To the eastward there was a great rolling country extending from the sharp snow-streaked foothills downward by easy stages to the lakes and marshes and forests that parallel the Susitna. This is the new gold country known to the miners under the name of the Yentna diggings. As we searched with our glasses along the creeks we saw several miners' tents, and about ten miles away on a bluff to the side of a large creek we noted five tents and this we took to be Sunflower.

About three miles beyond Sunflower, we saw a beautiful lake out of which poured the water and the gold of Lake Creek. This lake was surrounded by a great green expanse that appeared like finely cultured farm lands with fruit trees and waving fields of grain. And about four miles beyond there was a deep depression through which poured the Kahilitna River.

Plans were now made for the future line of march. The pack train must descend about one thousand feet and move over a muskeg to the lower edge of the lake, ford Lake Creek, and continue over similar country to the Kahilitna and from thence westerly through the lower foothills to the south of Mt. McKinley. With this itinerary in view Beecher was sent back with instructions to the packers to proceed to Sunflower, while Miller and I pushed on to examine the land over which our next march was to be made. We had left camp without carrying lunch, intending to return in a few hours, but the hours passed rapidly, and we descended and stumbled over the muskeg to the first miner's camp. We saw no one around, and as our appetites were sharpened and we were tired we invited ourselves to the hospitality of the camp.

There was a cache built of logs and raised on the stumps of four trees. It was a picturesque little hut, out of the reach of bears and wolves, and almost out of the reach of miners. We improvised a ladder and found under a canvas roof a large supply of flour, bacon, and beans. A curious log cabin with a canvas roof was next examined. It had luxurious furnishings for a prospector's shack. A sled was raised for a table, there was a block of wood for a chair, and two raised beds of roughly hewn wood and brush. A Yukon stove completed the fittings. All kinds of delicacies were hidden under the beds and about

the corners. Tins of condensed milk, cans of meat, jars of marmalade, butter, and biscuits. We had been without food for ten hours and to stumble upon such an array of tempting things was beyond our power to resist. We helped ourselves to a modest lunch out of the open tins when we discovered the following legend:

NOTICE.

This camp is the property of Sam. Wagner, and anybody coming along is welcome to use camp. Leave it as you find it and pack away what you bring. Use your own provisions as these don't grow here. If any one steals anything from here, he will be treated with a gun as a common thief in accordance with the law of the land.

SAM. S. WAGNER.

With the food choking us we started for Sunflower to face the law of the land. It was a leg-breaking run of five miles over hummocks, into soft marshes, through brush that tore our clothing in strings, and across deep, swift streams. At Sunflower we were heartily received by the miners, and Mr. McDonald, the principal promoter of the new stampede, invited us to his overcrowded camp to await our pack train. As we were adding to the previously unfinished meal Sam Wagner joined us. We explained our misdeed at his camp and he eased our consciences by inviting us to a smoke.

Just why this camp was christened "Sunflower" it is hard to conceive. Before entering its spruce studded and brushy confines we were forced to ford several icy streams and as we ascended the

bluff the cold water dripped from our torn shirts and trousers. With chattering teeth and boots full of cold water we were attacked by clouds of mosquitoes who took advantage of our reduced courage. The spirit with which one enters Sunflower is not in accord with the conception of a land of sunflowers.

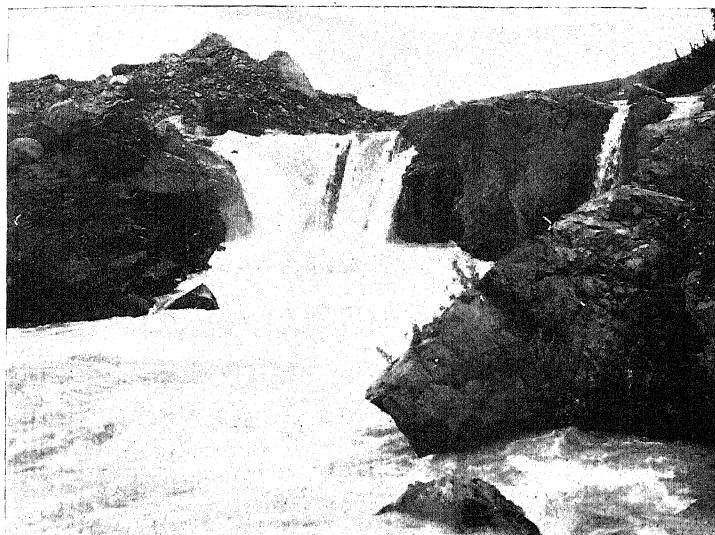
CHAPTER VII

OVER GOLD-STREWN LOWLANDS TO MT. MCKINLEY FROM THE SOUTH

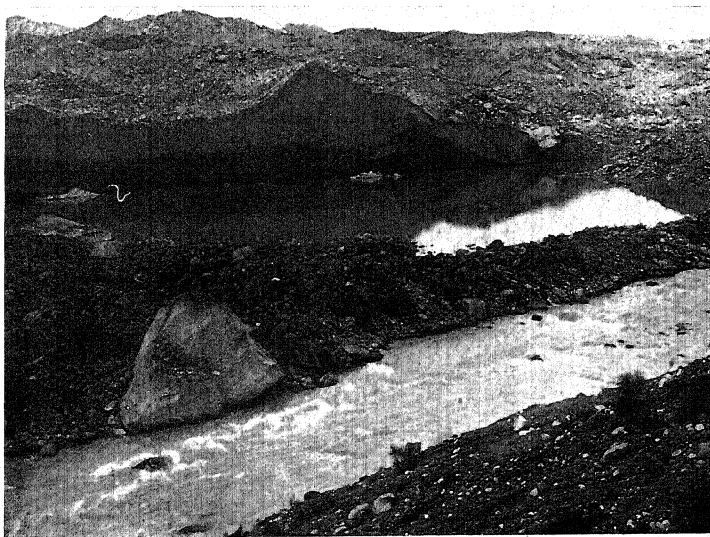
IN THE course of two days during which it rained constantly the pack train came along and Prof. Parker reported having had a terrible time crossing marshes. The grass however was good and in spite of hard work the horses steadily improved. At noon on the 12th we started for the Kahilitna, under the guidance of the Indian Susitna Pete, "he of many devils," whom McDonald loaned to us for three days. Pete infused new humour in our camp life but his appalling laziness was a bad example for the discipline of our party. Pete had never seen pack horses at close range before, and he took a keen interest in the animals. Furthermore he was openly inquisitive as to our motives in bringing so many men and so large an outfit into a wilderness where even his own people could not subsist. His contact with the miners led him to the conclusion that the new invasion was for gold. There could be no other incentive to push so desperately into a land of hardships. Pete had himself found a hatful of nuggets which he sold for four hundred

dollars, and he agreed to guide us to where gold was "heap plenty." We told Pete we were not after gold, and asked him to guide us to the top of the big mountain, to which Pete did not reply but cast at us a searching eye, thinking perhaps that either we did not tell the truth or there was something wrong with the arrangement of our heads. After a little better acquaintance he seemed to prefer to believe that we shammed a dislike for gold.

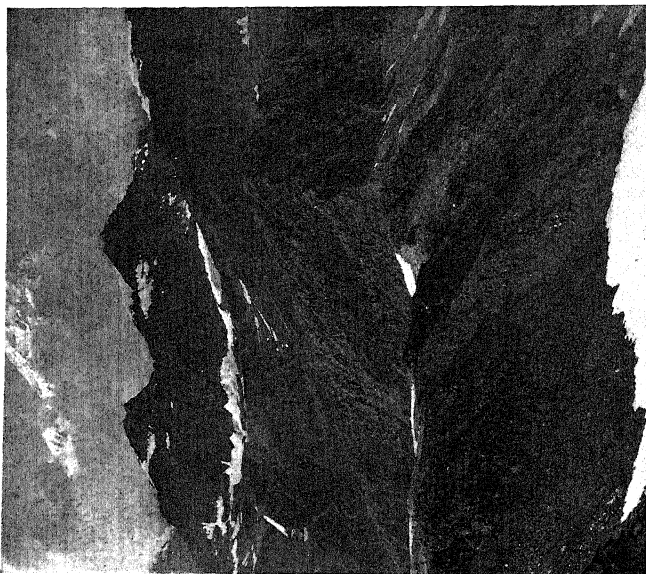
With Pete in the lead the horses struck up a lively gait out of Sunflower, over grassy swamps, around beautiful lakes in which floated pond lilies, through widely separated groups of spruce trees around which roamed ptarmigan with their chicks just leaving their nests, to Lake Creek. Here Pete sat down and waited to see what we would do. There was a raft of two logs tied together by suspenders in the lower lake, and this was captured by Parker and Browne for crossing. As they pushed out into the current, the suspenders broke, the logs separated, and the rafters were forced to straddle both logs, and pole in an exciting fashion. Parker had lost faith in the fording of the cayuses, and took to rafting as a relief from the peril of the rapids, but this rafting experience brought him back to his horse with renewed friendship. The other members of the party each secured his favourite cayuse and prepared to ford or swim as was our habit in the Yentna. The horses were urged to jump with



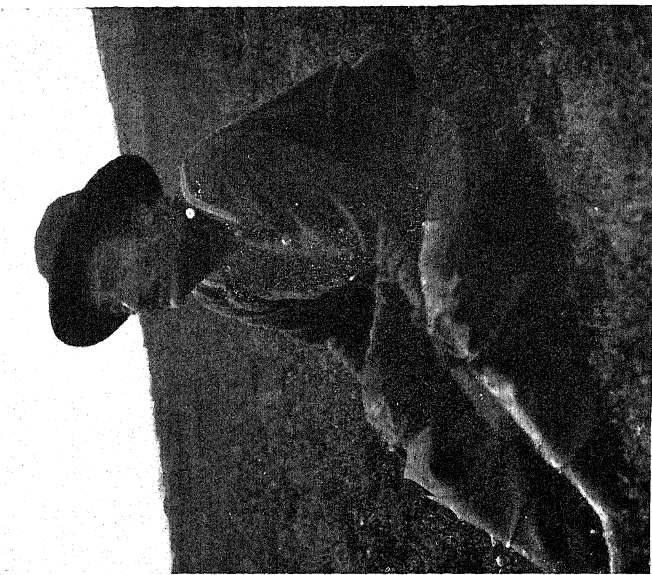
OUT OF GREAT BLUE CAVERNS AND OVER PRECIPICES, THE GLACIAL WATERS
POUR WITH A MADDENING RUSH



THE PLUNGE OF THE GLACIAL STREAMS
Face of Huntington Glacier



MT. MCKINLEY SEEN FROM BROWNE RIDGE



SUSITNA PETE

He of many devils, who places the spirit world around Mt. McKinley

men and packs from the bank into what seemed a shallow stream, but it proved to be just short of swimming water. Pete instead of guiding us watched each horse to see where he could pick an easy crossing and then pulling up his hip boots he followed in water that was not more than knee deep. Just before stepping ashore he stumbled into a pool and sank to his neck. We pulled him out sputtering Indian swear-words and prepared to continue the march, but Pete insisted on building a camp-fire to warm up and dry out. We were about as cold and wet as Pete, but the pack train could not be halted on such a pretext. We must warm up with increased exercise.

Late at night we came to an edge of a bluff and beyond we saw the face of a large glacier from which rushed the first waters of the Kahilitna. We descended about seven hundred feet and pitched camp in the basin. On the following day we crossed the river, edging along to get the water as shallow as possible in small slews. We were two hours crossing this river as the water was spread over an area of over three miles. Keeping close to the northern side of the glacier we cut trail through small spruce and dense underbrush over an old moraine. We camped at a point where eighteen years before the Susitna chief had hunted moose. But so far as we were able to find out the place had not been visited since. The next day we rose out of the brush and timber, left the glacier

and followed a stream which the miners have named Dutch Creek.

Camping in a bunch of cottonwood where Pete declared there was lots of gold we panned the creeks and found colour but no pay dirt. The pools were alive with trout and bear tracks were so numerous that no one would venture away from camp without a gun. Pete declared there were seven moose beyond the next ridge, and that ahead there were plenty of caribou. He started out to do big shooting but he returned in a few hours without meat, still asserting that there were moose and caribou beyond the next range.

The march of the following day took us over the watersheds, through the head waters of Dutch Creek into Bear Creek. Descending Bear Creek we came to a sudden opening of a "U" shaped valley on a bluff from which we were able to gather the first knowledge of the land to the south and east near Mt. McKinley. Two huge glaciers poured through parallel gaps and their waters, passing around a group of jagged peaks, which Pete called *Tokosha*, united to make the Tokositna River. Upon one of these glaciers we hoped to find a highway to Mt. McKinley. We descended about a thousand feet, cut trail through a dense jungle of willows and alders, and camped in the basin of the Tokositna.

Pete had been with us his allotted time and was told that he might return to the miners' camp, but he enjoyed our camps and our food

and above all he was still thoroughly inquisitive as to our motives. The mountain-climbing project he was not inclined to take seriously, but he also began to doubt our mission for gold, for he showed us gold and we did not stake the ground as did the prospectors. Instead of using the picks, the shovel and pan, we went about with pencil and paper and all kinds of instruments, which he did not understand. The cameras, the barometers, the thermometers, the prismatic compass, and all of the other apparatus came in for a careful scrutiny. When the topographer got out his plane table, theodolite, and steel tape and began to measure a base line, then Pete looked up with a sigh of relief, for according to his understanding we were measuring off claims.

While peeping through the telescope of the theodolite, Pete thought he discovered a bear digging out a ground rat far up in the mountains. His face lit up with a knowing expression. At last he had discovered our real vocation. All of this strange apparatus was to locate wild animals and in some mysterious way to place the gold deposits on a map, and for several days he made himself comfortable about camp at our expense to verify his guesses at our mission. As a guide Pete was a failure, for our horsemen preferred to pick their own way. But as a character study he made a splendid model.

We had about reached the limit of advance by pack train, therefore in our future efforts we must

make pack animals of ourselves. The horses were left in charge of Printz to graze in the lowlands while a scouting trip was planned to the top of a system of foothills from which we hoped to outline our future campaign. We expected to follow the glacier far into the foothills, and then climb some peak offering a favourable outlook, but the lower glacier was impossible because of its troublesome hills of moraine material.

The stream was too deep and swift to ford and it rushed out of a canyon in which we could not gain a footing. As a last resort we cut trail through the lower brush and climbed to an old glacier shelf at twenty-seven hundred feet. Following this bench northward for several miles we climbed to the top of a peak eighteen miles south of Mt. McKinley. Pete had not been asked to join the party but he followed our tracks, and as we got to the difficult climb over steep slate slopes we waited for him to catch up. Since he was with us in the rôle of a guide and helper, I turned over my rucksack to him but he protested against carrying it saying his feet were sore and his shoulders pained. The pack remained on his back, however.

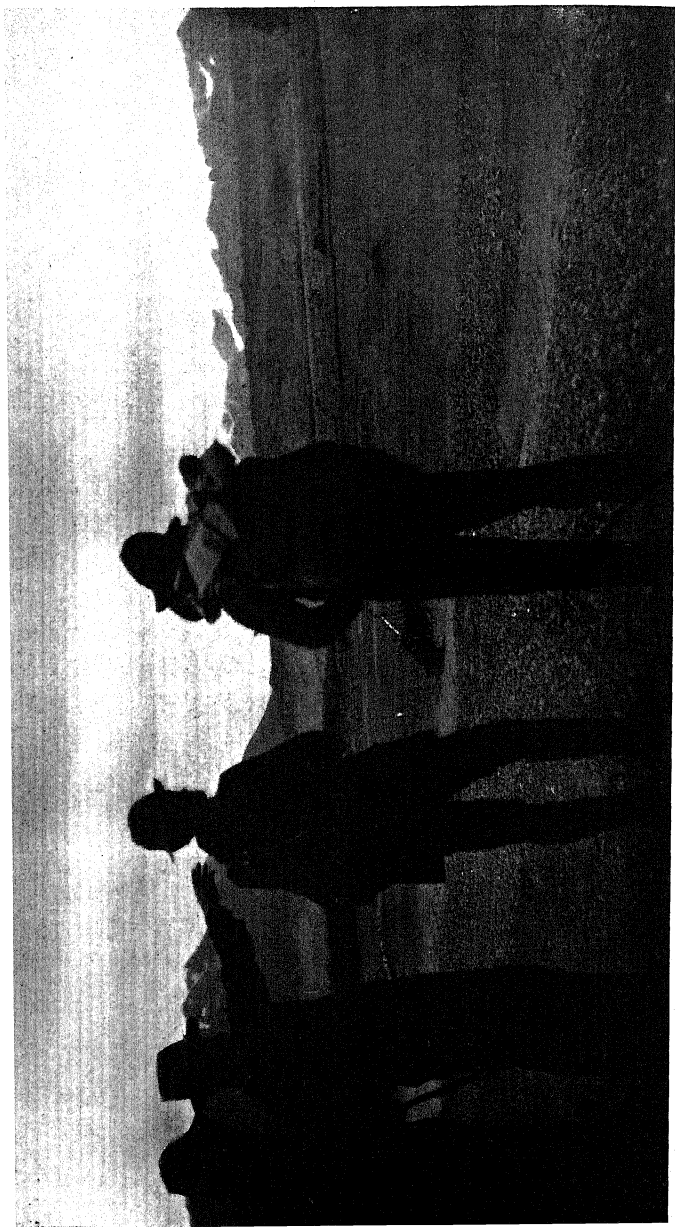
The first outlook from the summit was disappointing. Dark clouds screened the higher foothills and also the middle slopes of the great mountain. Parker and Browne climbed another peak and as they neared the top, for a few brief moments the southerly face with its death-dealing plunges of sheer granite cliffs was unveiled. After a quick



FOOT-HILLS EAST OF MT. DISSTON



TOP OF BRYANT PEAKS



THE FACE OF HUNTINGTON GLACIER
Waiting for the unveiling of Mt. McKinley.*

but careful examination Prof. Parker pronounced the mountain unclimbable from the south and east, and advised against any further advance from that side with a view of climbing. I was inclined to coincide with the Professor but desired to camp at our point of observation to watch the walls of the great mountain with its easterly environment under changing conditions of light and shadow. For this purpose Browne volunteered to stay with me. While the mountaineering aspect of our project was discouraged by the first views, the chances for important exploration had increased, and to this end orders were sent with the returning men to move the main camp with the horses to the side of the lateral moraine at the base of the mountain upon which we were encamped.

The silk tent was soon erected, the teapot filled with snow, and the alcohol lamp cheered the frosty air. The sun sank under the clouds behind a system of new mountains. The glory of colour and contour was beyond the reach of the camera, and beyond our powers of interpretation. We were permitted only to see bits of fascinating landscape through openings in the screen of vapour, wherein we noted huge cornices showered by gold and great gaps levelled by a liquid-blue and purple. We drew the robes about us and peeped out every few moments. The clouds seemed to settle and freeze to the icy armour of the mountains.

The purple haze faded with the afterglow

and a milky whiteness spread over the great naked peaks with a sky-line of the purest alabaster which remained all night as the sun edged along the north pole. During the night the temperature was low and the wind strong, but we were so eager to see the changing run of light and colour of the weird, fantastic figures over which the eye ran to the glimmer of dawn that our shivers seemed only as pauses in the reading of the poetry of an arctic dreamland.

The overwhelming bigness of the whole scheme of new mountain wilderness did not impress us until the first beams of light burned on the sky-scraped peaks, and shot through gaps into the yawning cuts which separated the buttresses from each other. The light and colour which during the night were so soft and delicate now became as savage as the cliffs that were illuminated. Blinding darts shot out from a thousand snow slants and shivering shadows of indigo sent a wave of gloom to our hearts. Mt. McKinley with its fifteen thousand feet of successive cliffs rose out of a crumbling, tumbling sheen of lesser peaks to the level of the gods.

A larger surprise than all this was the discovery of a huge peak midway between Mt. Foraker and Mt. McKinley, but much nearer our point of observation. We had seen this peak from several points, but were inclined to put it down as a part of the general uplift around the base of Mt. McKinley, but now we clearly made out that it was

a giant peak in the midst of a separate group of mountains, divided from the others by an intrusion of slate. This mountain was christened Mt. Disston, in honour of my friend Henry Disston. Beyond a part of the south-east ridge of Mt. McKinley we noted Mt. Hunter, which loomed up as a great mountain from our line of ascent from the west in 1903, but from the south this was seen to be a spur of the main mountain. Between it and Mt. Disston there was noted a narrow but deep gap through which Ruth Glacier sends an arm to the south shoulder of Mt. McKinley. To the south and west of Mt. Disston there is another wide break where we believe Huntington Glacier sends arms to a system of gathering basins.

Mt. Disston has three peaks, the highest of which is 14,970 feet high. Its very remarkable position in the path of an endless train of heavily laden clouds coming out of the warm Japan current and drifting along the Alaska Range makes it a barrier. The great bunches of vapour sweep against Mt. Disston, condense, freeze, and the resulting snow scatters in the hundreds of amphitheatres that feed the great glaciers. The easterly drainage of Mt. Disston is sent by numerous tributaries into Wyckoff Glacier, which is about two and one half miles wide and twenty miles long.

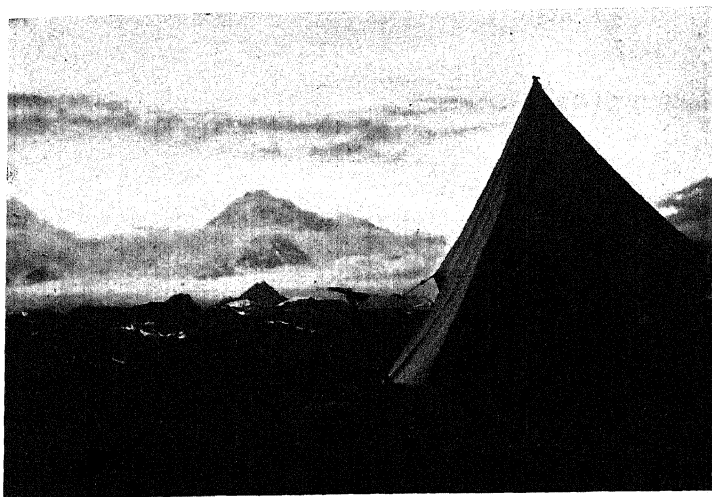
From our better acquaintance of the approaches of Mt. McKinley and its precipitous walls we were not able to come to a more hopeful climbing prospect than that so forcibly expressed by Prof.

Parker though we gathered much other data for future use. Descending to Wyckoff Glacier we met the pack train and pitched camp beside a huge boulder in the upper edge of the willows. Here was good grass for the horses and we planned to give them a long rest while the easterly approaches to Mt. McKinley were being explored.

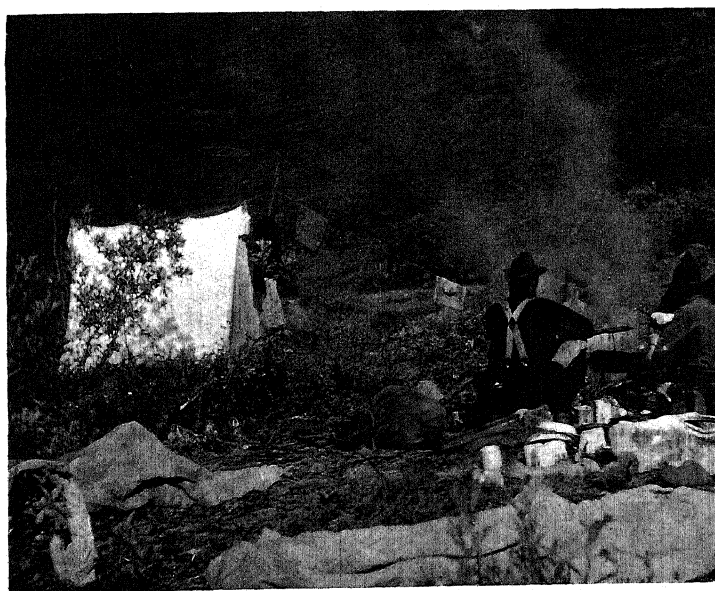
The climb of Mt. McKinley was now put down as a hopeless task but we determined to devote about a week to the study of Ruth Glacier and to the general exploration of the easterly foothills. Mr. Porter selected for a series of observations the ridge separating the two glaciers.

Parker, Browne, and Barrille joined me in an effort to cross this ridge to explore Ruth Glacier into its tributaries. With the camp equipment in our rucksacks we started on the morning of July 21st. The weather was remarkable for its short chilly rains and spells of burning sunshine with a smothering heat. Our route over the glacier was through hills of sharp fragments of granite and quartz, around great caverns, over ice tunnels where the glacier waters roared with a mad rush en route to the lower country. We were three hours in crossing, and the task should have completed the day's work, but we were eager to rise to some eminence where we could see the curtain rise and fall with the dusk and dawn.

Out of the glacier we climbed through brush and high grass, over the blueberries and flowers of the old glacial moraine, crossing bear trails



MT. DISSTON AND MT. MCKINLEY FROM A FOOT HILL 20 MILES SOUTH



CAMP SCENE ON NEW GOLD DIGGINGS

In the low country south of Mt. McKinley, an area of 3,000 square miles was explored



THE EASTERN CLIFFS OF MT. MCKINLEY

every few moments. We had passed so many bear tracks that this did not now excite our curiosity.

We had taken no rifles, but Porter and Browne had had such exciting experiences with the inquisitiveness of this race of bears that they insisted on being armed with Luger pistols. With the ambition of a nimrod Browne kept far in advance. We were leisurely trailing into a deep gulch along a picturesque cascade to a point where the stream forked. Browne descended to the waters, crossed, and ascended on a ridge between the streams. We picked an easier way along the right bank close to steep slopes to the other side of the gulch where was a high ridge with more gradual sides marked by bunches of alders. We were bending our heads and shoulders under the heavy weights of the rucksacks when Barrille shouted "Bear!" Every fellow at once braced up and looked about for a rock or a tree to climb, but there was nothing in sight to climb except big mountains so we bunched up and watched the coming of *Ursus* with a tight grip on our ice axes. The great mass of brown plunged down with an alarming speed, turning somersaults in the high grass, edging around precipices, and vanishing in bunches of alders, coming like a dart through gaps to hummocks, down and down, ever nearing the noisy stream which separated him from Browne. He was making a bee line for us, but we had gotten new courage and had planned a line of

defence with our ice axes. Along the crest of the bluff which must be climbed to get to our flesh Browne had the only gun, the Luger pistol. We called to him to save the day and our necks, but he did not understand. He had not seen the thing and the rush of the twin streams was such that he could not hear what we said. The bear was fording the waters as we called, and began to ascend Browne's ridge as he came toward us to ascertain the cause of our excitement. The bear came over the edge of the bluff and Browne met him. They were face to face, not more than twenty feet apart. Though excited Browne quickly drew his Luger and took a slow careful aim. We impatiently listened for the shot and watched for its effect on the bear—but nothing happened. The bear stood still, so did Browne, for what seemed to us several minutes, and then Browne slowly backed about fifty feet, sat down in the grass, and watched the bear. For a time we believed Browne had gotten out paper and pencil and was calmly sketching Bruin, but we soon discovered that he was awfully busy with his Luger—and then unexpectedly the thing went off. The bear jumped into the stream and Browne emptied his Luger to no effect. With the bear on the run we gathered new courage and rushed forward to head him off with the hope that he would take a course parallel to Browne's ridge where another shot might be more successful, but the bear avoided his chance acquaintance and took to the

high hills, where Porter awaited him over a plane table with equally elusive results.

Rising out of the bear haunts we camped in a saddle from which we could see both glaciers. Two days and two nights were spent along the ridge with splendid results for Porter from a topographer's standpoint, but no new mountains or glaciers or routes to Mt. McKinley were discovered. The weather was daily assuming a wintry aspect. The snow line was descending and new ice forming every night. The combined result of this reconnoissance proved to us finally the hopelessness of further mountaineering from any point of attack which could be reached before the coming winter closed the gates to the upper world. In this spirit we returned to camp to devise a plan for further exploration.

CHAPTER VIII

WITH THE DESCENDING CLOUD WATERS BACK TO THE SEA. THE PARTY SCATTERS

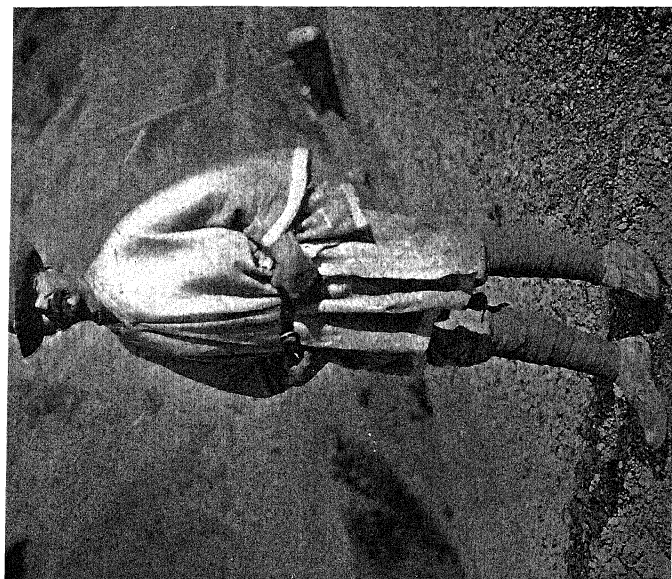
OUR study of Mt. McKinley seems to indicate that the only possible line of ascent is along the north-east ridge, which we believe most accessible from the west. To reach this ridge, but more especially to reorganise, and collect big game specimens on the Arctic Slope, is our next problem. In returning over the gold country we have decided to leave Porter with two assistants, two horses, and several caches of food to complete the map of the new country, after which he is to return by raft to Susitna Station.

The horses were now in splendid trim. The long rest and the young tender grass near the glaciers infused them with a new spirit. With light packs the return march over our old trail was rapid. Pete left us at Dutch Creek to go to his camp on Cache Creek. While building a cache on the Kahilitna bluff on the evening of July 28th, two days later, Pete stumbled into camp under a big pack and exclaimed, "Glacier busted!"

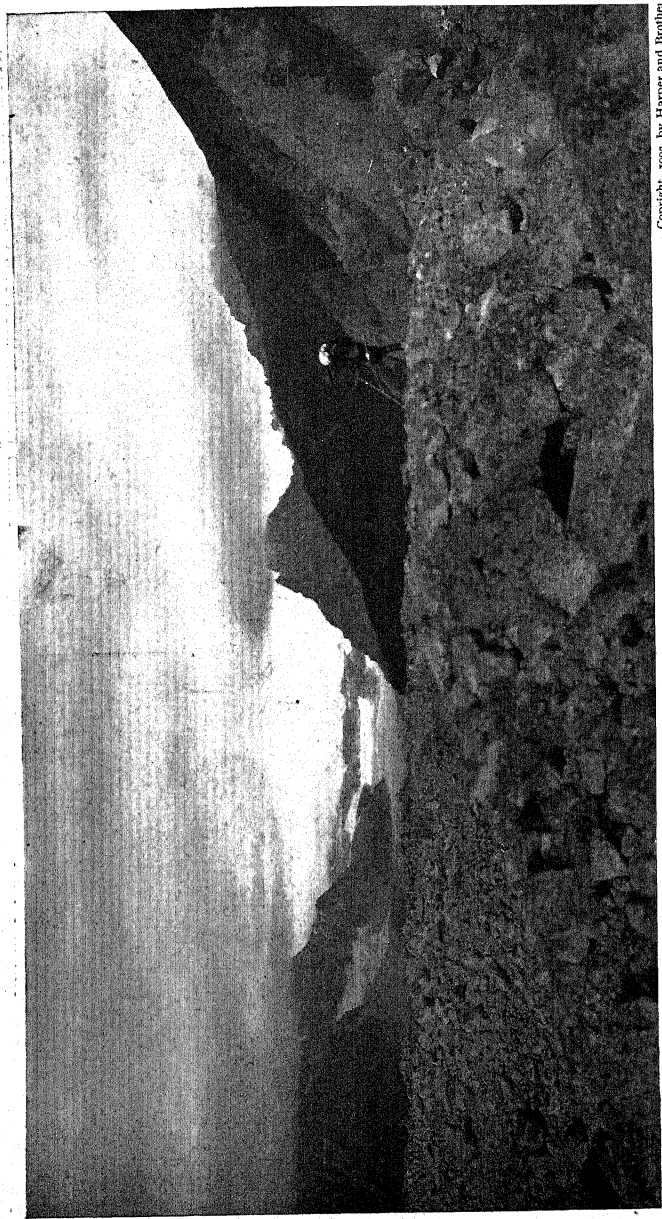
In crossing the Kahilitna we had noticed that



THE SILK TENT



EDWARD BARRILLE WITH THE CAMELS-HAIR SECTION
OF THE SLEEPING BAG AS A PONCHO



OVER THE MORaine OF RUTH GLACIER

The lower ten miles of this, and most of the McKinley glaciers, was completely covered with moraine

the river was very much higher and concluded that something had gone wrong with Pete's water devil far up in the big mountain. But now Pete explained it all. He called our attention to the basin of a large lake to the north side of Huntington Glacier. In our northward trip the water in this lake was almost level with the glacier. This water had now burrowed a tunnel under the ice and had joined the other rushing torrents to swell the Kahilitna.

In crossing Lake Creek the next day Pete decided to try a horse and ford as we did. He selected a bay mare, young and active, in fact too much so for the other members of our party. The mare was easy to approach and Pete had no trouble in being friendly. Barrille helped him mount, the mare shot off like an arrow into mid-stream, Pete was game and held on. Suddenly the horse stepped into shallow water and bucked. Pete went several feet into the air and landed in deep water. A wave of suppressed merriment ran along the line.

The pack-train moved on to Sunflower. Here we camped at noon to study the miners' luck. Gold had been found everywhere, but there was food nowhere. Most of the miners had come in with about a week's supply on their backs and this was hardly sufficient to reach a creek and scratch for colour. Most of these prospectors were leaving in a disgruntled humour. Barrille and Printz in fishing with rifles secured four salmon weighing about forty pounds each, and we fell

to salmon so enthusiastically that we did not care to eat fish again for weeks.

While packing for our return to the Yentna, Pete requested to be allowed to follow us with his squaw, who had been left at Sunflower, and without further talk brought all of his belongings to be packed on our horses. There were several deep streams to cross on this trail, and Pete, either from a sense of humour or from a sense of devotion, secured the bay mare to ferry his wife over the cold waters. The mare only followed him a few hundred feet and then dragged him through the bushes and left him besmeared with mud. The boys persuaded him that the mare objected to his red sweater, and he promptly took this off and packed it away, but he was not able to approach the mare again. Barrille gallantly loaned his horse to Pete to ferry his wife over the river, but afterward it was difficult to persuade the squaw to dismount.

As we neared the Yentna, Browne and Miller volunteered to join me in the venture of getting to Parker House while the pack train moved along to Youngstown. Our mission was to take the *Bolshoy* and all the supplies down stream. Horses could not be used, for we were anxious to conserve horse strength for the westward trip. We found a miner who ferried us across the main river, but after that we were left to our swimming capacities to cross the swollen slews. We reached the Parker House late in the afternoon of July

31st, after the most detestable water adventures of the entire trip. The slews were high, the whole jungle was afloat, and we were in water for about three hours. We determined never to repeat this experience.

About Parker House the whole river had changed. The easterly streams were very much larger and the main westerly slew had been reduced to a mere rush of small rapids. Around the launch a new bar had formed which nearly left the boat stranded in a blind slew. We built a camp fire to thaw out, then prepared to fit the boat for her descent to Youngstown. It was nine o'clock and the sun had settled into the Kuskokwim before we were ready to start, but the afterglow was bright and the July twilight was promising. Furthermore the ten miles of swift waters to Youngstown would take us only an hour. We dragged over bars, under overhanging trees, over roots, and plunged into the wider river near the forks, with the speed of an automobile. But here, when we felt at ease, our troubles began. The *Bolshoy* went aground on one bar after another; finally we threw out both anchors in disgust, and at three o'clock we dropped on the sands in the light of a big camp-fire for a few moments' rest. When we awoke the chocolate waters were fired by the rising sun and we were buried in the feathery ashes blown from the cottonwood fire. We were several hours digging the boat out of the new deposit of silt in mid-stream and at last, freed by the main force of the

current, we pressed on to join our companions at Youngstown.

Barrille was left in charge, and John Dokkin, a miner, was added to our expedition. Barrille and Dokkin were to cut trail into the Kichatna and prepare for the westerly trip while the others of the expedition went down the Yentna in the *Bolshoy*.

Under less than half power we averaged fifteen miles per hour in our plunge with the descending cloud water to the sea. If our motor-boat adventures up stream were a joy, the downward rush was a sport with the wildest kind of excitement.

The *Bolshoy* pushed cautiously over the bars of the delta of the Susitna River, into quiet Cook Inlet waters. In jumping snags and shooting rapids down the swift icy waters we broke the rudder and bent all the blades of the propeller. We might have beached the launch and replaced the propeller, but the rudder was beyond repair. We had rigged the stern so two men could steer with oars, and in the river this makeshift worked very well. Since the screw was pushing us along at the rate of eight miles per hour, and the boat was in perfect control, we decided that it was safe to risk a passage over the thirty miles of treacherous sea with a tide of eight miles per hour to Tyonok. We had no ballast. The first ten miles were covered quickly, but we noticed that a sea was rapidly rolling out of the east. Two miners' dories

were seen edging the increasing whitecaps (one of these has not been heard of since). Turnagain Arm, which is the storm centre of Cook Inlet, did not look bad, but the increasing force of the wind and sea coming out of it made us anxious. A few steel-coloured clouds, separated by bright glistening bands, came hurrying out of the narrow gap. The cloud effect was odd, though not particularly suggestive of a storm—but the storm came quickly. The little bunches of steel-coloured vapour were hurled at us as though from a cannon. The seas with our course gave us a broadside which made the little craft turn and twist and crack until we felt that she must go to pieces. We were now compelled to take the seas on the quarter, making a zigzag course. This brought the breaking, tumbling water aboard. Browne and Printz on the poop steering with care were twice nearly swept over into the boiling waters, and to secure them they were fastened by lines to the deck. The engines balked somewhat because of the violent commotion of the boat, the low temperature, and the mud of the cooling waters. Two were kept busy at the engine, and all under cover were miserably seasick. In our desperation we tried to run into the Beluga River out of the storm, but the endless low flats with mountains of sea breaking over them did not look inviting. The Chulitna, another river, was our next hope, but as we allowed the wind and sea to carry us into the bay we noticed that the dan-

gers were even greater than at the Beluga River—seas which we estimated were fifteen feet high rolled under us and broke on the beaches but a few hundred feet away. One went over us and for a second the entire boat seemed to be under water. Some one exclaimed at this moment, "Beach her!" but since flats extended five miles from shore, with a blast pitching us on shore and a sea breaking everywhere, we were not in a beaching mood. But we must do something quickly. Tyonok but five miles south was to us as impossible, with the onshore wind and the raging sea, as Chulitna. To cross Cook Inlet to the windward shore was our only hope, but this was not an agreeable prospect. The night with its awful storm and blackness was before us. With men lashed to the deck who might be swept off, and with no harbour within two hundred miles, we thought it best to push from the land out into the night and into the gloom of the continued storm.

The wind now came in gusts, but with a force that held us on the crests of swells as the engines were pushed to do their best. The rise and fall of the launch at this time was sickening. Tumbling from the seas she would crack as if she had struck a rock, and frequently Prof. Parker said, "What have we struck?"

In spite of our efforts to cross the inlet the strong tides carried us southward, and as we neared Tyonok the seas became choppy, the wind eased, and the prospect of making a landing seemed

worth trying. We pushed under a spit, dropped anchor, lowered our little fourteen-foot canvas boat, and in it Browne and Printz pushed through the breakers into the river. Mr. Finch, with a crew of expert Indian boatmen in a big dory, came and took us off. We had weathered the worst storm of the season in the north country without a rudder and with a crippled wheel! It was an experience which none of us cared to repeat, but it was a fitting addition to our other hardships. For more than two months we had been in icy streams and drenched by cold rains in the uplands. Cold water was ever about us whether on sea or land. Indeed, Prof. Parker pronounced the effort of ascending Mt. McKinley a marine task.

In the middle of August there were various changes made in the personnel of the expedition and in the working programme. Prof. Parker, unable to remain longer with us because of the necessity of his returning to his college duties and other business matters, left us. The projected trip through the range into the game country along the western slopes was abandoned and various parties were scattered for collecting specimens of animal life and to survey new districts. Owing to our repeated failures and the advancing winter we decided that our energies for the short period of the remaining season would be better spent in exploration than climbing, and to this end our plans were now made.

At this critical moment, when we were anxious to get to work quickly to carry out the new plans, the *Bolshoy* was Hobsonized. To weather a storm she was taken into the creek behind Tyonok. All the other small craft of the Cook Inlet fleet followed, and finally the big stern-wheeler *Caswell* ran into the mouth of the river and went aground. The tides were "nipping off" and we were thus hopelessly locked in the river for an indefinite time. After waiting nearly a week we took our boat overland and prepared to push up the Susitna to continue our work.

CHAPTER IX

UP THE SUSITNA AND CHULITNA BY MOTOR BOAT

IN DRAGGING our boat overland the circulating pump was broken in such a way that we could not fix it. Anticipating such an accident we had provided ourselves with an extra pump, but to adjust this we were compelled to take the *Bolshoy* to the machine shop of the Kaselif Salmon Cannery. Through the kindness of Mr. Witherbee the pump was fixed, and then preparations were made for the final trip against the easterly torrents of Mt. McKinley.

Though it is agreeable to come out of the wilderness of the interior to the semi-civilisation of the coast occasionally, we usually found the coast environment induced ill-health for a time.

In the pursuit of our routine we were almost constantly wet with ice-water. For two months we travelled with wet feet. In rain or sunshine, in wind or calm, we went without coats for the simple reason that with increased clothing we carried more water and therefore were less comfortable than with light simple garments which would dry out easily. We slept in dripping jungles, on floating marshes, in wind-swept clouds,

on wet snow, and in perennial frost, always with the worst element about us. Surely here were conditions to cause colds, rheumatism, pneumonia, and all kinds of winter diseases, but we never enjoyed better health. No colds, no rheumatism, and no sickness of any consequence was reported. But when we returned to the outposts of civilisation and warm dry beds, breathed the comfort of good shelter in luxury, were gluttoned with food and prevented from taking our accustomed exercise, we promptly suffered from headaches, toothaches, colds, tonsillitis, neuralgia, and all kinds of physical troubles.

Our immunity from disease is a lesson in physiology worthy of more minute examination. The real cause of taking cold lies in the balance between the production and radiation of heat. Likewise the real cause of many of our most troublesome diseases, like headaches, insomnia, rheumatism, gout, neuralgia, and many minor complaints lies in the difference between the process of assimilation of nutritive fluids and that of the elimination of waste products. With an active life like ours in the wilderness every function of the body is called into service and there is soon established a normal equilibrium in the movement of cellular construction and destruction. Under these conditions the processes of repair and waste are active and new cells are fitted into the fabric strained under tension; worn-out tissues are removed, and the process of normal health proceeds without

interruption because of a compelled rhythm in all of the usual functions of life.

How different are the life-sapping conditions of modern city life. Physical exercise is prohibited by the limits of space and the ease of mechanical locomotion; mental energy is strained to cope with the maddening pace of this material age. The stomach is abused by unnatural foods, the liver and kidneys are hardened by poisonous drink, the lungs breathe a hothouse, germ-cultivated air, the muscles wither from disease, the whole splendid cellular organisation is disarranged in an endeavour to fit man into an artificial environment for which animal life was never intended. The misfits result noticeably in the breaking down of some important department of biologic association, and disease follows. If mountaineering has no other recompense than to act as a means to arouse dormant functions and to establish a normal balance in the laboratory of human economy, it is a boon to mankind.

Owing to the lateness of the season and the non-arrival of other members of our party, we now decided to abandon the projected trip into the Kuskokwim and scatter the party to collect game specimens in more accessible places, and to continue the work of exploration. Browne and Beecher were sent into the mouth of the Matanuska River to get moose, mountain sheep, and goats. The *Bolshoy* pushing up the Yentna quickly reached the camp at Youngstown on August 28th.

From there Printz and Miller were sent into the valley of the Kichatna with five horses, also to gather game specimens. Four horses were sent to Porter to ease his task of transportation and then, taking Barrille and Dokkin, I descended the Yentna to the Station to refit for the next stage of the work.

As a final task for our season's work I now determined to explore the river systems and glaciers to the east of Mt. McKinley, and to examine the northern arête for a route to the top of the mountain for a possible future ascent.

With a full load of food and gasoline the *Bolshoy* was pushed up the Susitna. The upper waters had not before been tried by a motor boat and the miners doubted the ability of our launch to climb the rapids. The river was moderately high, but there was before us the chance that the early frosts would suddenly stop the melting glaciers from sending down their output and so reduce the rivers that we would be unable to get down stream.

The scenery was rapidly changing from its run of dark green to the warm colours of autumnal foliage. Beyond the delightful line of birch and spruce along the shore the eye rested upon a wide expanse of muskegs cushioned knee-deep by fluffy verdure in delicate colours of green and brown pegged down with buttons of cardinal. The currants and the cranberries had withered; the bears had left the river and the berries

to dig out the fat ground rats near the tops of the foothills; the beavers and rabbits were active; ptarmigan were descending from the snowy highlands and moose and caribou tracks were seen in the silt along the river. Altogether this race for time against the tumbling waters and the advancing winter night was very interesting.

The Susitna, like the Yentna, is divided into many slews, and pours its brown waters over a broad expanse in great graceful curves, but it has a very much more difficult current to stem. The average mid-stream current is about seven and one half miles per hour, and to dodge the swift water proved a great task. Perhaps the worst feature of the Susitna is its manner of spreading over wide flats and then rushing in rifts over bars that extend across the river without a deep channel anywhere, thus offering swift and very shallow water, which is extremely difficult for a power boat.

We ascended the first sixty miles in two days without any great trouble, but in entering the Chulitna we lost a day because of the shallow water. Trying one slew after another, we were stopped in each as we were about to push into the main stream. Finally we took the most westerly channel and lined the boat for a few miles, dragging her over bars when necessary by placing an anchor out and pulling in the rope by the capstan. About ten miles above the forks the Chulitna narrows to one deep, swift channel

where low rolling hills lead to a plateau through which the river has cut a narrow channel with canyons three hundred feet high.

The scenery in the lower river is rather tame. The valley is wide and the trees along the river prevent a view of the great spread of the Susitna lowlands, but now we have risen in altitude considerably and are able to look over the lower valley to the snow-streaked Chugach Mountains. Ahead the foothills close in on the stream and in the occasional clearing the big peaks of the Bolshoy group are visible. The rock of the canyon appears to be grey wacke. Above the canyon, which is about five miles long, the river spreads out, and as it nears the Tokositna it turns abruptly to receive its waters.

Pushing the launch up the Tokositna to the first stream from Ruth Glacier a camp was made within easy reach of the terminal moraine. We had gone about half way through the boiling rapids. The big boulders here indicate that Ruth Glacier at one time extended at least four miles beyond its present moraine. The river above would have been navigable by lining for a few hundred feet, and beyond the waters seemed to be deep and easy for about twenty miles farther. Preparations were made to stay here for several weeks. Barrille built a crude pier for the boat, of drift logs weighted down with boulders. This was necessary because of the sudden rise and fall of the glacial waters, also because of the swell

produced by the rapids. Dokkin was so fascinated by the place that he prepared to winter, intending to start mining operations there in the spring.

CHAPTER X

DISCOVER A WAY TO REACH THE SUMMIT OF MT. McKINLEY.—PREPARATIONS FOR THE CLIMB

AFTER a preliminary examination we were convinced that our position was a very fortunate one. The limits of navigation had not been reached on either river, but for our purposes it was not desirable to push the launch farther. Within three miles of our landing was seen the end of Ruth Glacier, and through its gap we were able to make out a line of attack to the north shoulder of Mt. McKinley, from which we now discovered a way to reach the summit of that mountain.

With the *Bolshoy* safely harboured we began to establish a base camp. The surroundings here were agreeable: To the east, but a few miles distant, were the bold uplands and the wooded lowlands of the Chulitna and Susitna valleys; to the west the new gold country, the foothills of the Alaska Range in which we had left our topographer; to the northwest, forty miles away, far above the clouds, the summit of Mt. McKinley, the Top of the Continent, the Ultima Thule of our ambition.

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In going up the Chulitna we noted carefully every snow-slope of the big mountain. We had already changed our minds as to the impossibility of climbing the mountain. Three promising routes were carefully plotted in our note-books, with all possible landmarks. We aimed to tabulate these routes at long range so thoroughly that if we were caught in a storm while climbing we could still travel by this previously noted line of landmarks.

The weather during the entire summer had been the worst ever noted along the eastern side of the range. Continuous cold drizzling rains made the work of exploration and climbing nearly impossible, but now there was a radical change: the thermometer fell to near the freezing point in the lowlands, and above two thousand feet the winter snows were beginning to accumulate. There was a dryness and briskness to the air which aroused anew our ambitions to climb Mt. McKinley.

Our intentions, however, were not to climb to the top. The winter, with its heavy snowfall, its death-dealing avalanches, its storms and awful cold, was too far advanced in the upper world. We hoped only for an opportunity to discover a route that would permit a future ascent and to explore the big glaciers starting from the northerly slopes, and to this end we prepared our equipment.

The conquest of a mountain of this size so near the arctic circle required more than ordinary

preparation. We had no guides and no porters, and no camp followers to take from our shoulders the usual hardships of alpine ascents. The very great difficulty in moving supplies to the base of the mountain prohibited such assistance. In preparing our equipment I had determined to break away from the established method of mountain climbing by reducing the number of my party and by changing the working equipment. The work in prospect as we had originally planned it required not days, but weeks and perhaps months, during which we must sleep on storm-swept snow-fields, and for the prolonged siege we must carry food, fuel, and shelter on our backs. With blankets, heavy tents, and tinned food such a project would be impossible. To meet the need of reduced weights and increased efficiency I had invented a new silk tent which weighed but three pounds, was large enough for three men, and required no pole.

That we might be able to sleep on ice in low temperatures Mrs. Cook had made for us three novel sleeping-bags which were a great success. With a woman's ingenuity three robes were made in such a way that they could be buttoned together and hooked up along the edge, making a sleeping-bag. However, it was not only a sleeping-bag but an overcoat besides. The outer section was made of cravenette, the inner section of camel's hair blanketing, and the middle section of the skins of eider duck covered both sides with



Mt. Church

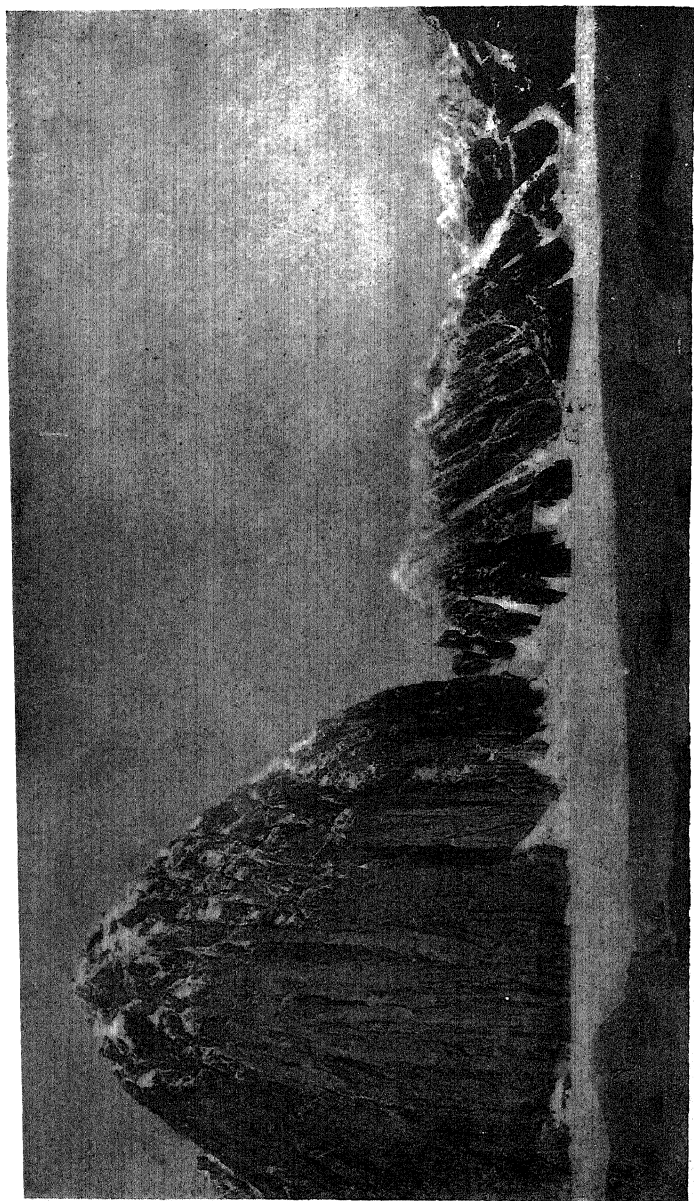
Mt. Grosvenor

Mt. Johnson

Mt. Wake

FIRST FIVE OF THE TWELVE NEW PEAKS OF RUTH GLACIER
Camp at 5,000 feet

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Mt. Bradley



MT. BARRILLE: THE NORTHEAST RIDGE

Shantung silk. These robes could be used separately or together as ponchos, and with belts they made a perfect garment. We carried no coats or waistcoats. The sleeping-robes furnished us all the protection that we needed.

We did no relay work or double-tripping. We moved no heavy tents nor other cumbersome equipment. Rapid marches, light packs, and but the prime necessities of camp life were to be our method of action. We aimed to carry on our backs about forty-five pounds each, and this pack was to contain all our needs for ten days. We were thus independent of each other and independent of a base camp or a supporting party.

We spent a day in the preparation of this pack. Our clothing needed some mending, and to bake the right kind of bread required a good deal of study. Crackers and all kinds of factory-made biscuits are in my judgment not only troublesome to transport, but their nutritive value is decidedly inferior to properly made bread. In the first attempt we were forced to invent some kind of mountain bread, and we then tried to imitate zweibach, which proved very good. In the preparation of any food for a high altitude one has always to keep in mind that such food should not require cooking nor should it contain a particle of moisture. Ordinary bread would freeze so hard that it would require hours to thaw it out, consuming precious fuel which must be carried on the back. Our experiment here resulted in the

invention of a biscuit which I would recommend for any work where the temperature is low and fuel scarce. We mixed the dough in the usual way with baking-powder but omitted shortening. This dough was divided into little bits not larger than a good-sized marble and baked in the reflector by a hot fire until quite brown, then the reflector was moved farther from the fire and by slow heat the biscuits were dried and hardened. No grease was put in the pan nor in the dough

Distributed as expedition baggage we carried a silk tent, rubber floor-cloth, tent pegs, three aneroids, barometers, two thermometers, one prismatic compass, a watch, and a 5 x 7 camera with six film packs, the total weight of which was twelve pounds. This was distributed among the different packs.

The luggage which fell to each as common baggage was:

Food.....	twenty-one pounds
Fuel.....	two pounds
Sleeping bag.....	five and one half pounds
Sleeping stockings....	eight ounces
Alcohol stove.....	two ounces
Aluminum pail, cup, spoon, and pocket knife.....	four ounces
Horsehair rope.....	one pound
Ice axe.....	three and one half pounds
Rucksack.....	three pounds
Expedition baggage..	four pounds

Thus the total weight for each climber to carry was somewhat over forty pounds. We carried no extra clothing except one pair of sleeping socks. As we left the boat we wore medium-weight suits of woollen underwear, heavy flannel shirts, short trousers, puttees, four pairs woollen socks, shoe packs, and a felt hat.

We had underestimated the arctic effects of even the low altitudes and had not our bags been made in sections which, as ponchos, furnished a splendid protection against the awful cold above, we could never have been able to begin the climb.

With all these things snugly packed in our rucksacks we started from the *Bolshoy* where the altitude was 1000 feet, on the morning of the 8th of September. It was a bright clear day with the temperature near the freezing point. But a few hundred feet from camp we saw fresh moose and bear tracks. We followed these tracks a short distance, and then discovered a blazed trail cut by the gold seekers. This trail led to Ruth Glacier, and after crossing several icy streams in which we got wet above our waists we found to the north side of the glacier an old caribou trail where travelling was excellent.

As we followed these game trails a sharp wind was blowing and the air had a touch of winter bitterness in it. The great chasm out of which the glacier poured its frozen product was roofed by masses of dark gray clouds ranked closely and hurrying swiftly. The curious tunnel between

cloud and glacier, through which we saw snowy peaks, was weird and gloomy but our attention was fixed upon it for it was the track of our future efforts.

On the evening of the second day we took to the ice, crossed the first northerly tributary, and camped on a beautiful moss-carpeted point about fifteen miles from Mt. McKinley.

As we crossed the glacier and jumped the crevasses Dokkin developed quite a fear of the bottomless pits and said that he would prefer not to trust his life to the security of his footing. Barrille and I had been on glaciers before and did not entertain the same fear. Indeed we regarded this glacier as one particularly free of danger and hardship. Its surface was unusually smooth. We had about determined that the limit of our effort would be the top of the north arête at 12,000 feet; from there we believed that we could thoroughly outline the glacier drainage and also a route up the mountain. For this purpose Dokkin was not needed, and since he wished to prospect for gold in the lowlands I sent him back with instructions to read the base barometer and to place emergency caches along the glacier.

The snow on the glacier was hard and offered a splendid surface for a rapid march but the advantage of its hardness was offset by the treacherous manner in which it bridged dangerous crevasses. As we advanced these snow bridges increased and we held to our horsehair rope with more interest.



THE MIDDLE NORTHEAST SLOPES

Where avalanches tumble from slopes unseen to depths unknown



AN AMPHITHEATRE

A typical amphitheatre basin of the Mt. McKinley district

As the sun settled behind Mt. McKinley and threw a shivering blue over the mammoth glacial canyons about us the tent was pegged down on the mossy shelf. Here our eyes first danced to the dazzling glows and the wild notes of enchantment and despair of a snowy cloud world. We were making discoveries in every direction. The gates of a new world of arctic splendour had opened. In line with the magnetic needle the glacier continued with graceful curves and like a thing of life, its arms reaching up to the easterly outline of the great monarch of mountains. To the west of this snowy bosom of ice our anxious eyes ran from peak to peak of wondrous mountains entombed by gauzy films of gold. With utter amazement we counted twelve cone-shape peaks in an air line all 12,000 feet high, the last a pinnacle in the huge northern arête making a barrier to the conquest of Mt. McKinley. To the east of this wonderful line of frosted and polished cones there was another row of less regular but sharper peaks with sheer walls of yellow granite down which avalanches plunged for 5000 feet without a shelf.

The scene changed every minute, clouds came and went swiftly. The blue changed to purple, the purple to lilac, and at last a black veil of sadness dropped over this new world of arctic evanescence.

With this peep into the frosty splendour of our future camping environment we knew that

at this camp we would leave behind the last traces of life, for in the icy altitudes above neither plant nor animal life could subsist. We were eager to celebrate this departure from life by a feast with the greatest possible comfort, for feasts and comforts as we understood them would be impossible in the upper world!

Under the silk tent was a soft carpet of moss in delicate shades of brown and green and red. From this moss we were able to make a cheerful fire and thus save the precious alcohol which we had carried thirty miles for a fire higher up. Among the lichens of the upper rocks we heard the shrieks of numerous ptarmigan. After some delicate manœuvres that would do credit to a mountain goat, Barrille secured five of these with his rifle. To make the birds palatable proved to be a task more difficult than the hunt. With wet moss we could not get fire enough to broil the birds. To cut them and make a kind of soup was our only resource but we had no salt and no flavouring material, and the thought of a parboiled bird without salt was not pleasant. We filled the aluminum pail with snow, cut the meat in small strips, and as the snow melted we tossed in the meat. After boiling for about an hour and a half, Barrille tasted the meat and said it tasted like oysters without lemon. I tasted the soup and it was impossible. We had carefully eliminated salt from our food because of its tendency to produce thirst. Barrille put in some pemmican

which gave it a sickening sweet flavour. I added some crumbs of bread which helped a little. Finally Barrille said, "Let's put in the mixture some sugar and tea and our feast will be complete and it will save us the wait for the tea after." I yielded to the sugar and tried it, and to our great surprise this seemingly impossible mixture passed our palates without protest. A sweet soup with sugared meat, what joys it brought us! But we never repeated the experiment.

The night was dark and gloomy. There was an occasional fall of snow from the low clouds sweeping along the surface of the glacier. From a long distance there came low-pitched rumbling noises like that of a farm waggon over a rocky road. These were the premonitory warnings of the avalanches. Sharp winds were piping frosty notes through granite crevasses but in our silk tent and buttoned in our eiderdown bags with stomachs full of sweet soup and sugared ptarmigan, we were serenely happy.

Dawn came with a weird blue glow from the west. The high frosted foothills to the east brightened and warmed to an orange tint but there was a long arctic twilight with an oppressive stillness interrupted by sharp explosive noises due to the movement of the glacial stream. In this twilight we saw the stars through the silk mesh of the tent as clearly as at night in lower lands. The outlines of the mountains were also clearly seen through the tent while we were resting comfortably.

As we turned out of the tent the glacier and the mountains toward the Chulitna were for a short time free from the usual drift of clouds. The great tongue of ice descended four thousand feet in about thirty miles. The lower ten miles of the ice was completely covered by a thick spread of finely broken granite and slate thrown up in huge hummocks. There were curious lines of moraine running in parallel courses above. The striking differences in colour of these rock streams distinguishes this glacier from all others. The black of the slate, the buff of the granite, and the blue of the ice made a run of attractive, contrasting streams.

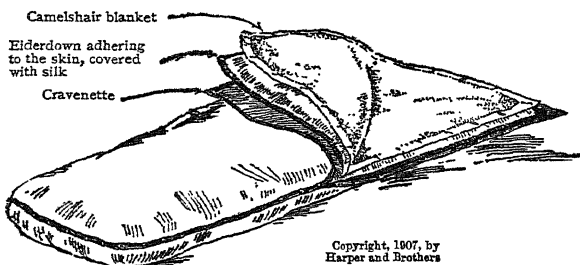
The Tokositna mountains with their sharp spires stood out in bold relief against a bunch of vapours moving hurriedly into the glacial cut. The wind on the glacier was westerly but these clouds moved in the opposite direction, indicating a contrary upper drift of air currents which explained the usual cloudiness.

We made an early start over the moss to the mountains of lateral moraine. Climbing the big boulders we studied the séracs through which our course forced us. The ice in the dim morning light looked enticing from a picturesque standpoint; great blue crevasses crossed the glacier and huge points of ice rose like the pinnacles of the polar pack. We enjoyed the scene but as a highway the outlook was discouraging. The hair rope was securely fastened about our waists and

then we descended into the widest of the crevasses, picking our way in the blue depths below across the glacier. Rising out of this frigid gap to the main surface of the ice we found the snow hard and a fairly clear spread of ice for miles ahead. The crevasses were still numerous; those visible were easily evaded, but those invisible were at times unintentionally located by breaking through snow bridges. Big cumulus clouds pressed against the southern slopes of the twelve peaks, but the narrow sky of the big blue canyon into which we were pushing was perfectly clear. A strong wind rolled from off the ice of the great mountain and it pierced us like the blast of an arctic winter. It was not until noon that the sun broke through the narrow gaps of sky-piercing foothills and then we changed our course to the north side of the glacier. The awful frost of the dense blue shadows combined with the icy head wind made advance rather difficult. The bright burning sunbeams falling on the glittering snow of the other side of the glacier were equally uncomfortable, for now there fell from our faces big beads of perspiration, which froze in icy pinnacles on our garments.

Because of the splendid progress made we allowed ourselves the luxury of a mid-day lunch. We tried to set up our alcohol lamp in a big grotto, but deflected currents of air so blew the blue flame that the heat was lost. The tent was set up and in it we brewed a pot of tea, ate pemmican and

biscuits, and rested for two hours, and then as the sun sank behind the big cliffs of the main mountain we took up the march again into the frosty shadows. Before dark we pitched the tent on the glacier at an altitude of 8000 feet within a few miles of the northern ridge, the summit of which, 4000 feet above, was at this time our ultimate destination.



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CHAPTER XI

TO THE NORTH-EAST RIDGE.—IN A SNOW HOUSE
AT 12,000 FEET

FROM here the stupendous wonder aroused by the titanic uplift sent a thrill of amazement over us which carried its note of fear and admiration for many days.

Just as Mt. Tacoma surpasses all other American mountains in quiet softened grandeur, so Mt. McKinley transcends in savage magnificence and in colossal proportions all mountains of the world. While there are other mountains greater in altitude, still these are a part of a general elevation, and as individual peaks the great mountains of the world are less attractive.

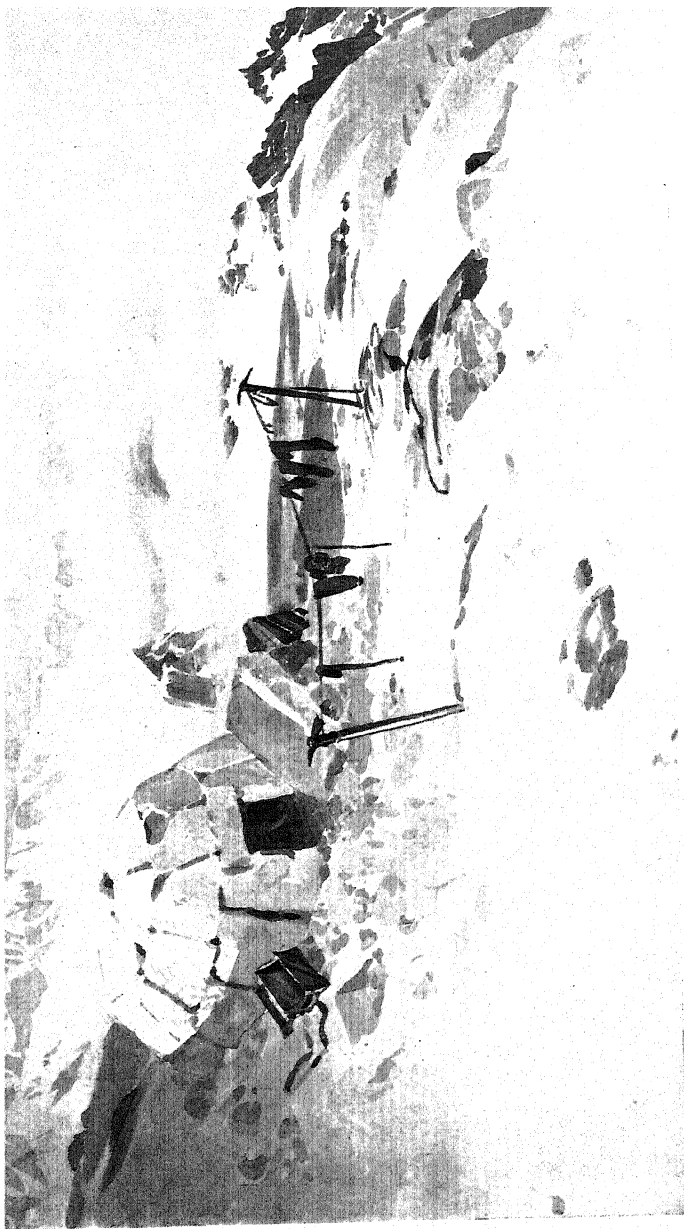
There are mountains where the blend of colour, the scale of dripping waters, the waves of balmy breezes run to music and poetry and quiet æsthetic inspirations, but there is no such play on the senses here. Mt. McKinley is one of the severest battle-grounds of nature, and warfare is impressed with every look at its thundering immensity. The avalanches fire a thousand cannons every minute and the perpetual roar echoes and re-echoes from a hundred cliffs. The pounding of the

massive blocks from ledge to ledge in their mad descent makes the whole mountain world quiver with battle spirit.

We had every reason to be pleased with our rapid progress to this camp. In three days we pushed thirty-five miles into the foothills of an unexplored country and were now in a better position to attack the mountain than at any previous time during a siege of three months.

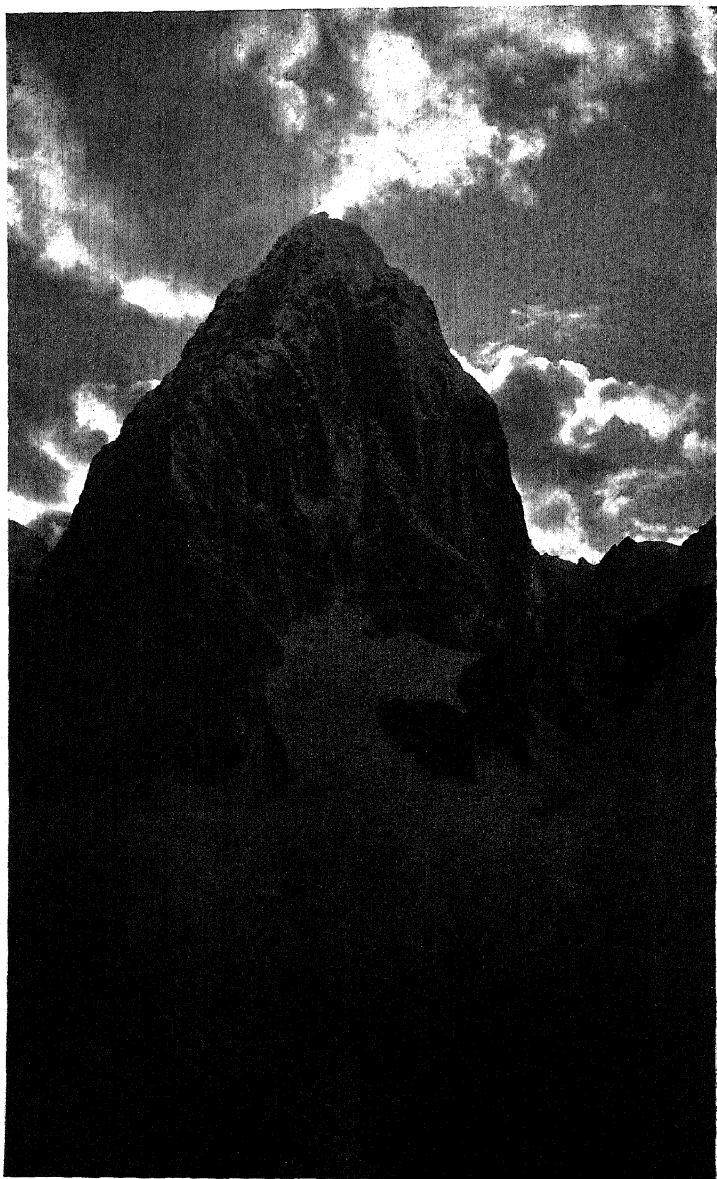
The main glacier here narrowed and turned sharply to the south-east, sweeping the whole eastern slope of Mt. McKinley. Feeders pulled the snows out of numerous amphitheatres and the main tributary sent prongs on to the great north-east arete. Indeed the gathering basins of the glacier were arranged like the leaves of a tree and huge limbs connected them with the parent mass of ice, completing the circulatory system from cloud to sea.

We realised the serious aspect of our next ascent into a region of cloud and storm, but we were now prepared for all contingencies. We had seen the great mountain from every possible side during our various campaigns. Along the west we had followed the face of the mountain for twenty-five miles. Along the east we had circled the base close enough to study carefully the giant slopes. Every glacier, every pinnacle, everything that could possibly be seen as a landmark or a route had been carefully charted. We knew that we could not possibly carry into the clouds a sufficient



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IN A SNOW HOUSE ON THE NORTHEAST RIDGE, 12,000 FEET



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IN THE SOLITUDE OF THE CLOUD WORLD

supply to permit of halts during storms. We must make progress and climb every day. Cloud obscurity or storms must not delay us and to be able to be thus independent of weather we must always know exactly where we were and know also the workable route and the dangers above and below. These points were splendidly met by our arctic equipment and our rapid sketch maps of the slopes of the mountain from every point of view.

The death-dealing spirit of the avalanches created more anxiety here than at any other camp, though we never failed to note this danger. The night was dark and we were restless like soldiers on the eve of a battle. Snugly wrapped in our bags we rested well, but slept little because of the violent thunder of avalanches and the angry rush of winds. Out of black clouds from the invisible upper world there rushed with the noise of a thousand cannons and the hiss of a burning volcano indescribable quantities of rock and ice mixed with snow and wind. The tumble from cliff to cliff, from glacier to glacier down the seemingly endless fall was soul-stirring to the verge of desperation. The glacier under us cracked, the whole earth about quivered as from an earthquake, and as we tossed about in our bags the snow squeaked with a metallic ring. That third night we felt as if we were at the gates of Hades. We were about ready to quit and seek a more congenial calling. But dawn brought its usual

inspiration. The temperature fell to zero, a heavy fall of snow cleared the gloom out of the sky, and a bright orange glow softened the depressing chaos of cliffs and spires into a sheen of sparkling splendour. While in our bags breakfast was prepared and eaten, and as the sun broke through the granite gap we tumbled out, rolled up our bags and tents, packed all in our rucksacks, secured the life line to our waists, and with axes in hand we started over the fresh snow for the cliffs of the northern arête.

The gaps of the crevasses widened, and the ice became more irregular, but the snow improved as we advanced. We chose the lateral moraine of the sérac of the first glacial tributary as a route into an amphitheatre. Here we found ourselves rising into the breath of avalanches too numerous and too close for our sense of security, but there were no other lines of ascent, so we pushed on into the gathering basin and into the clouds. The sunlight and snowy brightness were soon obscured by a curious gray-blue mist. The frosty chill of blue shadows and also the warm glow of sunbeams were absent and in their place a humid chill which is the usual effect of the cloud-world. With an eye on some rock we picked our way through mists, over dangerous séracs, to the frowning cliffs that made the circular rim of the amphitheatre. Here at noon we dropped in the snow, ate some pemmican, and rested long enough to permit the clouds to part and give us a peep at the

cliffs above. We were thirsty, but it would take more than an hour to melt snow, and this delay we could not afford at this time. There was no place to camp in the regions above unless we reached the top of the ridge and we still had about two thousand feet of step cutting and unknown trouble above us to a possible resting place. We rose farther and farther into the ragged edge of quickly drifting clouds. Rising from ridge to ridge and from cornice to cornice we finally burst through the gloomy mist on to a bright snow-field upon which fell the parting glow of the sun settling into the great green expanse beyond the Yukon. We were on the divide, the wall between the Yukon and Susitna.

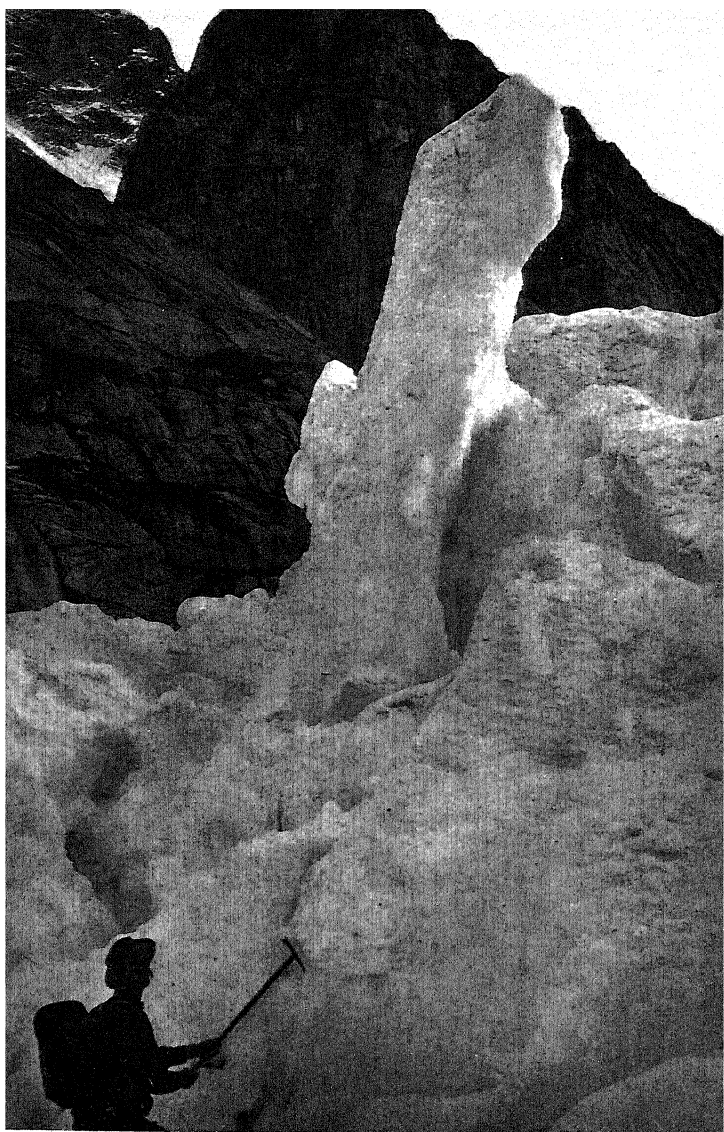
It did not take us long to discover that we were on the battle-ground and in the firing line of clouds from the tropic and the arctic. The winds came in gusts now from the east and then from the west; with each change there was a fall of snow and a rush of drift. This locality did not appeal to us as a camping ground. In seeking for a sheltered nook we found a place where the snow was hard enough to cut blocks with which to build a snow house. In less than two hours our dome-shaped Eskimo igloo was completed and thereby shelter and comfort were assured us for the time of our stay on the ridge.

The ice axes were driven into the snow, a rope was stretched, and on this line we hung our wet stockings and puttees. We had previously learned

that the best way to dry things out was to allow them to freeze and on the following morning to shake off the frozen moisture. Everything else was taken inside the snow walls and a block of snow was pulled in as a door.

In the snow dome we were splendidly housed from the wind and drifting snows. Even the deafening rush of the avalanches was muffled. The temperature outside was below zero but we were perfectly comfortable within. Thin sheets of rubber were spread on the floor first, the silk tent and all our outer clothing were next put down. The sleeping bags were placed on this and into them we crept with the confidence of enjoying a warm restful night. Our shoes and cameras and other bulky things were rolled up in our rucksacks and used as pillows. This done the snow camp was complete.

For the culinary process Barrille packed the aluminum pail with fine snow while I filled the lamp with wood alcohol. Soon the happy buzz of the numerous blue jets lowered the snow line and more snow was added. During this time we rested comfortably in our bags and braced our teeth to the hard fragments of tallow and dried beef. We had a sickening empty feeling and ravenous appetites and felt like spending the night in filling up. We were not at all particular as to the menu. I have heard mountain climbers speak of the difficulties of digestion; this was not one of our complaints, anything to fill the gap



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INTO THE BREATH OF DEATH-DEALING AVALANCHES

Picking steps over treacherous ice and snow, around polished spires, up and up to the heaven-scraped granite of the top



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ON THE BRINK OF AN ARCTIC INFERNO, 14,000 FEET

would have been appreciated. Fortunately pemmican changes a hungry man's mind very quickly, and this with tea and biscuits raised an atmosphere of contentment which could not have been equalled by a course dinner. We lived a simple life indeed.

Little streams of snow drifted through the cuts between the blocks that night, but we rolled over now and then, shook the snow from the flap about our faces, and renewed our slumber with even increasing joys. At the end of twelve hours we woke up with a gastric emptiness which called for immediate attention.

As we crawled out of the snow house we noted to our surprise that the clouds below had separated and were drifting northerly, leaving unveiled the unexplored mountains and glaciers, the study of which completed our main mission.

Here to the east we noted the burial place of a great system of clouds which, arising out of the warm waters of the Japan current far away to the south, drift poleward, and are interrupted by the sky-scraping peaks of the Alaska Range. A local current of air carries the clouds north-east and drags them from one glacial depression to another, over ridge after ridge, and peak after peak, until the beautiful forms of the clouds are torn into shatters and drift in sections to the surface of a glacier, dropping tropical humidity to augment the arctic output of the stream of glacial ice.

The west of the mountain presents a face twenty-five miles wide with one great glacier (Hanna) sweeping the entire reach. Here, too, we noted the destination and the final resting place of an endless train of active clouds. These clouds came out of Bering Sea and the Arctic Ocean, drifted against the range a hundred miles southward, and then like the clouds from the east they too were carried along the western side of the range by a north-east current. Thus the vapours of the tropics were precipitated to the east while the vapours of the Arctic were precipitated to the west. Here then is the meeting place of the frigid and the torrids. In every gulch, glacial gap, or valley the local winds rolled down from the upper slopes carrying down torn bits of clouds, with the result that there was a never-ceasing rush up and down, to and fro, in the cloud world. But by far the most interesting battle was along the saw-tooth cuts of the great north-east ridge. Here we noted a ceaseless warfare between the pale arctic clouds and the dark Pacific clouds. There was a great deal of change on the ridge in barometric pressure as we had noted, winds rushed over the ridge from the Susitna valley to the Kuskokwim and vice versa with a dangerous suddenness, carrying along clouds and drifting snow in huge quantities. All of this could be easily seen from our fourteen-thousand-feet ditch, while we shivered and hoped for better times. With the upper clouds on both sides of the range moving along

the general trend of the mountains, the lower clouds drifting away from the range, and the battle of angry vapours over the arête, there was a wilderness of commotion in the cloud world which quite dazzled us.

CHAPTER XII

TO THE BRINK OF AN ARCTIC INFERNO.—A NIGHT IN A DITCH AT 14,000 FEET

IN ABOUT an hour we had completed our observation and then we turned for a look at the upper slopes for a route to the top. A few stratus films were brushing the snowy crests above, and the sun poured a wealth of golden light over the giant cliffs, illuminating the rushing snow of the plunging avalanches with a wild fire. Along the east among the cliffs that had seemed impossible from below there were several promising lines of attack along narrow overhanging glaciers and over steep ice-sheeted ridges. Every possible route however from this side was seen as the eye followed it to the summit to be crossed somewhere by avalanche tracks. Along the west there was a similar danger from the sweep of the ceaseless downpouring rock and snow. Our only chance, and that seemed a hopeless one, was along the cornice of the north-eastern arête upon which we were camped. For some distance there was a smooth line of crusted snow with a sheer drop of about 4000 feet to either side. At about 13,000 feet this line was barred by a huge rock with

vertical sides of about 1,000 feet. Beyond this rock there were other cliffs of ice and granite, and beyond this was a steep arête over which we could go from the west to the northern face on to a glacier and into a valley between the two majestic peaks which we now saw graced the summit.

After so many failures along lines of attack which looked good from a distance we concluded that to determine the feasibility of this route it would be necessary to pick a way around the big rock and into the median depression of the mountain. If we succeeded, however, in doing this we might as well prolong our siege and try for the top. We had food and fuel enough for this, but the winter was so far advanced that the venture seemed imprudent.

With a half notion to climb to the summit, but with a more determined resolution to pick a route for a future ascent, we adjusted our rucksacks and life line and started on the morning of September 12th along this cornice. Soon the big southern clouds swept the mountain and we were left to grope among the spires in the misty blue of the cloud world. We found a way over a narrow cornice around the big rock and then we dug and scratched for a footing among the ice blocks in the narrow gorges between sharp pinnacles. With the dimness of the light and the limited range of vision we could not determine here the prospective course of avalanches, and this uncertainty gave us a great deal of anxiety. Our

course was very irregular, winding around granite walls into gloomy séracs, over dangerous snow bridges, the climb becoming more impossible with every step.

Out of an amphitheatre with its crescentic walls of granite polished by the ice of ages, over tumbling blue-ribbed streams of ice into the aërial mystery of sweeping clouds, groping for hours in the frosty night, picking a sure footing among treacherous cliffs, we at last broke through the clouds and climbed on to a wind-rasped cornice for a rest.

Every moment some colossal block thundered out of the clouds followed by a rumbling train of snow and ice. With bumps and roars and hisses, the seething run of débris came from cliffs unseen and plunged into echoing depths inconceivable. For days and months and years and centuries these reducing trains have been at work thus by chemical action, by the winds, by the sweep of the clouds depositing snow, by the action of the ice melting, by the spreading of ice in the rock crevasses, by the general expansion and contraction of heat and cold, by the force of gravity. The time must come, if this cooling earth lasts long enough, when this great majestic tier of chiselled granite above the clouds will all have settled into an ugly mound, a mere forgotten grave of an alpine monarch.

We continued our steep ascent farther and farther into the icy clouds curling above our

heads up the knife edge of the north arête, around a great spur, from cornice to cornice, cresting sheer cliffs over which there was a sickening drop of ten thousand feet, into the mystery of a lower arctic world, and then began the awful task of making a ladder for two thousand feet. With eternity but an easy step below every moment of this climb we went from hanging glacier to snow slopes, from blue grottoes to pink pinnacles, from security to insecurity, with the thundering rush of avalanches on both sides. If there ever was a more disheartening task it has not been my misfortune to be confronted with it.

We would have been glad enough to return and give up the task at this time but night was near and the little light that remained was blotted out by the gloom of a coming snowstorm. To return over the dangerous cornices in the dark was impossible. To camp anywhere within reach was equally impossible. For self-preservation we must move up out of the dangerous area. Keeping the rope tight we chipped steps as near the ridge as was possible and remained sheltered from the wind. One hundred steps and Barrille took the axe, then another one hundred steps and it was my turn. We could not see the slopes above for more than a hundred yards, and below everything was obscured by twisting clouds and drifting snows. It was black at seven o'clock. We dropped into the steps from sheer exhaustion. There is a limit

to human endurance, and we had reached that limit, but where could we rest and live for the night? There were snow slopes not far away, but they were swept by avalanches. The safest place was along the steep arête.

Our axes had been kept chopping steps all day, and our rise in altitude was very little, but we got beyond the barriers and out of the area of windy cliffs and frigid crags out on a steep snow-sheeted arête.

We uttered a sigh of relief as we rose on the icy steps of our Jacob's ladder, out of the gloomy dangers from below to the upper edge of the cloud zone. We uttered a good many other sighs of despair before the night was spent. The little colour which we were able to note between the cloud rifts indicated sunset. It was 7:20 by the watch, the mercury stood at 11° below zero, and the compass pointed to the tip of a new peak above the clouds 28° east of north, the only mountain visible. The thin blue haze about us was thickening to a colder blue, ragged outlines of torn cloud filaments were noted, crystals of snow fell as we rested and talked of the chances of camp or shelter on a cloud-swept slope too steep for a seat. The blackness of night was thickening fast and its chill increased in penetration with the decrease of the light. We knew that we could not descend to a sheltered spot, for there was none within the day's climb. The darkness was too far advanced and we were too

nearly exhausted to risk a farther ascent into the unknown dangers above. The slope upon which we had cut steps and seats in the ice was nearly 60° but the ice was secure, the snow firm, and the danger from avalanches small. As a duty to ourselves and our families we had no alternative but to dig into the icy side of the mountain and hold on for the night.

In this side-hill ditch we fitted ourselves securely with a view to the effects of slumber movements. For if we slipped from the ditch we would plunge thousands of feet through the clouds to the smoky depths of an arctic inferno. We wrapped ourselves in a bundle with all of our belongings including the silk tent, then lashed the bundle to the axes, which were securely driven into the ice and in this way we held on for the night. The fine snow drifted down our necks and into the cracks of the dug-out, but we did not dare to move for fear the snow would fill the gap, crowd us out, and we would be left to hold on to the axes to stay us from a death plunge.

Avalanches thundered down from both sides at close range. The night was very long and stormy. There were frequent rifts in the clouds through which we saw clusters of stars framed by silvery films of vapour—beautiful pictures in the retrospect, but we were then not in a humour to appreciate the glories of our outlook. We were interested more in the break of day and in the chances of getting to a place of greater

security. The thought of going to the top of the mountain was dispelled by the misery of that awful night. We were too tightly bundled to disagree actively, though we spent wakeful hours in mild arguments. We agreed, however, on two points: we must hold on, freeze to the ice if possible, and with the first light make for the low country, abandon mountain climbing, and take to a better life. But with the break of day with its fetching polar glory all of this disheartening note of abandonment and danger changed. Now our determination to retreat resolved itself into a resolution to go to the top.

With the chill of dawn the upper clouds froze to the slopes, while the lower clouds settled lower and lower into the maze of glacial canyons. Through these lower clouds there was a burst of fire and with it the great glittering spires above blazed with a glow of rose. This glow lasted but a short time, then the normal frost of purple and blue submerged every hope of feeling heat or seeing warmth in colour. As we dragged ourselves out of this icy ditch of terrors we were able to see that we had passed the barriers to the ascent. The slopes above were easy, safe, and connected, but the bigness of the mountain was more and more apparent as we rose above the clouds. Instead of our having to climb one mountain we were forced to deal with peak upon peak and mountains within a mountain. The task enlarged with the ascent. Rising over crest

after crest we finally reached what seemed to be the top of the mountain. But it was only a spur, and beyond it were many other spurs. The air became clearer and sharper with every step, and our exhaustion, mostly the result of sleeplessness and anxiety of the previous night, was increasingly felt.

Soon after noon we swung from the arête easterly to the glacier. Here owing to fatigue progress was slow.

The snow was hard and the slope such that little step-cutting was now necessary. Along the glacier to the gathering basin near the summit the prospective route rose in easy slants to our goal. Above it was perfectly clear, but below there was an ever-changing drift of cloud obscurity in which we had spent two days of despair. If torment is the test of Hades then the habitat of Mephisto was in that cloud-world at our feet.

There is a sinister and savage ferocity along the middle slopes of shelves and cliffs and clouds and storms that is accentuated by a precarious footing as well as by the rush and thunder of avalanches. Everything was snow covered as we looked over the sheen of death and destruction. There was absolutely no semblance of life in sight and it seemed months since we left the comfortable camp-fires. If it were a mountain of skulls it would not convey a more forcible sense of gloom.

In picking a way among the séracs we soon found that our muscles refused to work. Though

the climb was easy we could not gather enough energy to continue the ascent. The night in the ditch and the prolonged expenditure of energy along the middle slopes had pressed us to the verge of collapse. Under these circumstances it seemed best to seek a good camping spot on the glacier with a view to resting for a day to recuperate and store up force for the final spurt of the upper ascent.

CHAPTER XIII

GLORY AND DESOLATION ABOVE THE CLOUDS FROM 16,300 TO 18,400 FEET

WE FOUND a level space in a small amphitheatre where the snow was hard enough to cut blocks for a snow house, and though the view was magnificent beyond anything previously seen we turned our backs to visual glories and crept into the snow hut and into our bags to prepare for food and a long rest. While the alcohol lamp spent its feeble heat against the pail of snow we dozed, to dream of far-off comfort, awaking every few moments to the chills of an icy reality. Through the door we peeped at the changing sheen of gloom of the lower world.

For desolation it would strain the English dictionary to describe it, but there are shades of desolation as there are grades of intoxication. Last night the note of abandon was soul destroying. From our dug-out in the treacherous drop the outlook and the world about was desperately gloomy. To-night with the sparkle and glitter of the snowy world above the clouds, illuminated by glowing stars that hang like huge arc lights

from a black sky, we see another phase of desolation, one full of hope, inspiration, and promise.

In the lower climb there was a thrill which fired ambitions. The beauty of the naked cliffs raised us to a pitch of ecstasy which made us forget fatigue, but in the upper world all of this was changed. It was a region of harmony in colour and contour. A suffusion of light with subdued colour blends to frosty shades. A softening of contours by a flooding of snow crystals fills the ugly gaps and rounds off the sharp corners. But nevertheless it is a region of pulseless eternity where the spirits with the clouds fall to earth in weeping sadness. The lack of movement, the oppressive stillness, the absence of every speck of life impressed upon us the fact that we were utterly alone; the only breathing creatures in a great expanse of mystery far above the habitable world.

As the stifling blackness of night was bleached by the blue of dawn the whole weird run of unreality changed. The upper world of silent glory and snowy wonder was beyond human interpretation. We have a similar white world of deathly glory in the low polar wilds but there the clouds are above and there is sometimes a glow of warm colour, but here the clouds are below, the sky is black, and a frosty steel-coloured light is poured over the sparkle of the snow-fields. There is however a weird fascination in this curious supra-cloudland. It is difficult to grasp the thread

with which it rolls up its spool of mysteries, but to me the most striking is the paradox of light and colour: at your feet a dazzling whiteness, overhead a dense blackness, in space a gloomy neutral play of dull blues.

When I was a boy I had a distinct notion of the geography of heaven and of the regions above the clouds. The splendid colours of sunbursts, sunsets, and indeed all brilliant displays were manifestations of the glory of heaven, which I placed among the clouds. I did not know that there was a cloud-world rather close to the crust of the earth, and beyond, far beyond the blue sky which we believed to be the limit of space there was a great unknown without colour or light! In later years I was inclined to push the actual location of heaven into this mysterious void far away, but to-day I am bound to confess that I believe the spiritual future which we in a figurative way style heaven is very near the terrestrial surface.

As we ascended into this cloud world we thought of angels in light attire with wings, and of an easy world of rare glory. But how different was our realisation. As the great bunches of vapour which we call clouds brushed against us along the middle slopes we were submerged by a gloomy darkness preceded and followed by icy gusts of wind while the incessant showers of fine snow made a weeping spectacle. This environment of the cloud world was indeed opposed to a heavenly or even a con-

genial spirit. We were in desperate mood, without poetry or æsthetic appreciation; with heavy packs on our backs, treading a path through deep snow up dangerous slopes, where wind drove snow into our faces, down our necks, withal a depressing monotony of colour, and with no safe place where we could rest our weary bones. From cliff to cliff, from grotto to spire, from cloud to cloud, up and up farther and farther into whirling vapours we pushed until at last when we thought night had dropped over us, we suddenly burst through the clouds into a glistening pearly twilight with stars hanging low like electric lights. The brilliancy of this glittering half light was new to us, the darkness of the sky was even more surprising. This however as we learned later is one of the natural conditions of the land above the clouds. The snow here was such that we were able to build a snow house and in it we packed ourselves for a long rest.

As the stars were beginning to fade on the following morning, the sixth day of our climb, we kicked out the snow block which made our door, and crawled on to the crackling surface. The temperature was 15° below zero. The light increased rapidly, and the oppressive stillness contrasted strongly with the noisy rush of avalanches below. The marvels in this new world of ice were slow in penetrating our frosty senses. Even after we began to appreciate the anomaly of things we questioned our perceptions. We were

surely in a land of paradoxes. Here looking down ever so far below, we could see a sea of clouds whose upper filament waved in the gold of the rising sun, while above us was a dark gray-blue sky with the stars still visible. The snow and the rocks glittered with a weird brightness seeming to come out of the earth—darkness above, light from below; things were certainly topsy-turvy. This supra-cloud world is a land of fantasy, of strange other-world illusions. Here summers are winters and winters are what a polar traveller believes Hades ought to be.

Starting from camp, at 16,300 feet, picking a trail around successive séracs, our progress was good. We still felt the bad effects of our over-worked muscles on the lower climbs; but we hoped to be able to push on to the summit that day. However the increasing altitude, the very low temperatures, and the lack of nerve energy all combined to make our ascent extremely difficult.

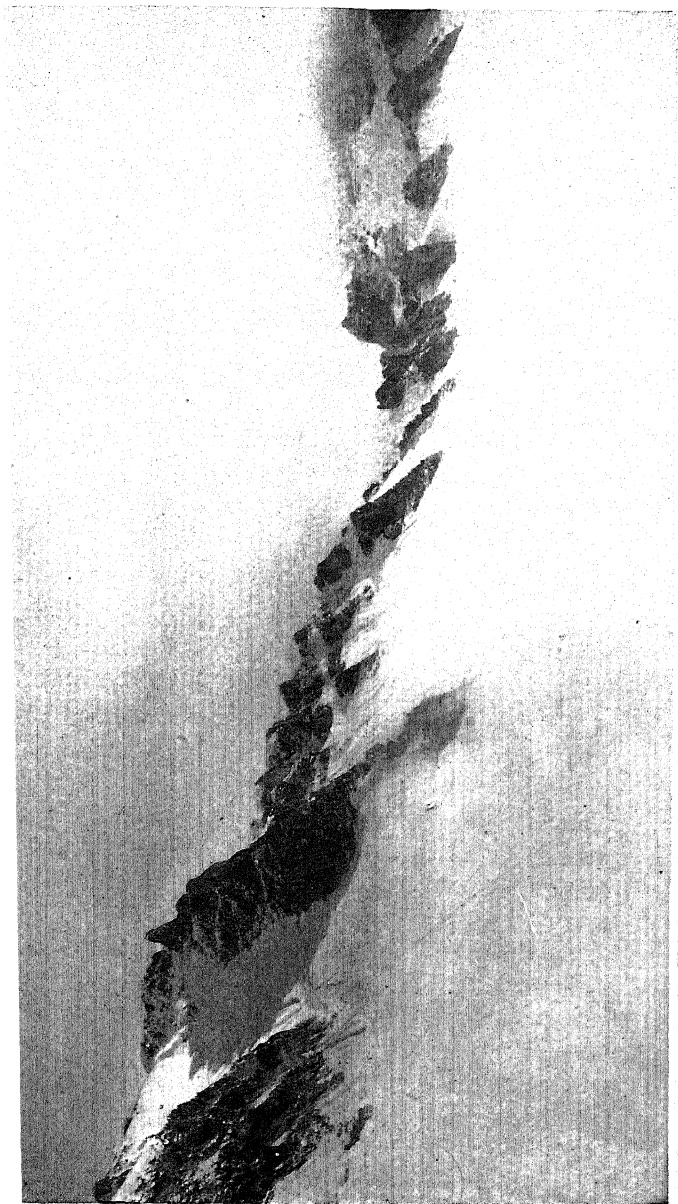
During the frequent breathing spells we examined the upper reaches of the mountain. We had seen the summit from various sides, but we were not prepared for the surprise of the great spread of surface. From below the apex appears like a single peak, with gradual slopes. From the northern foothills we had previously discovered two distinct peaks. But now, from the upper slopes, we saw that there were several miniature ranges running up to two main peaks about two miles apart. To the west a ridge with a saddle,

to the east a similar ridge, with one main peak to the south-east. This peak was the highest point, and to it we aimed to take our weary spirits.

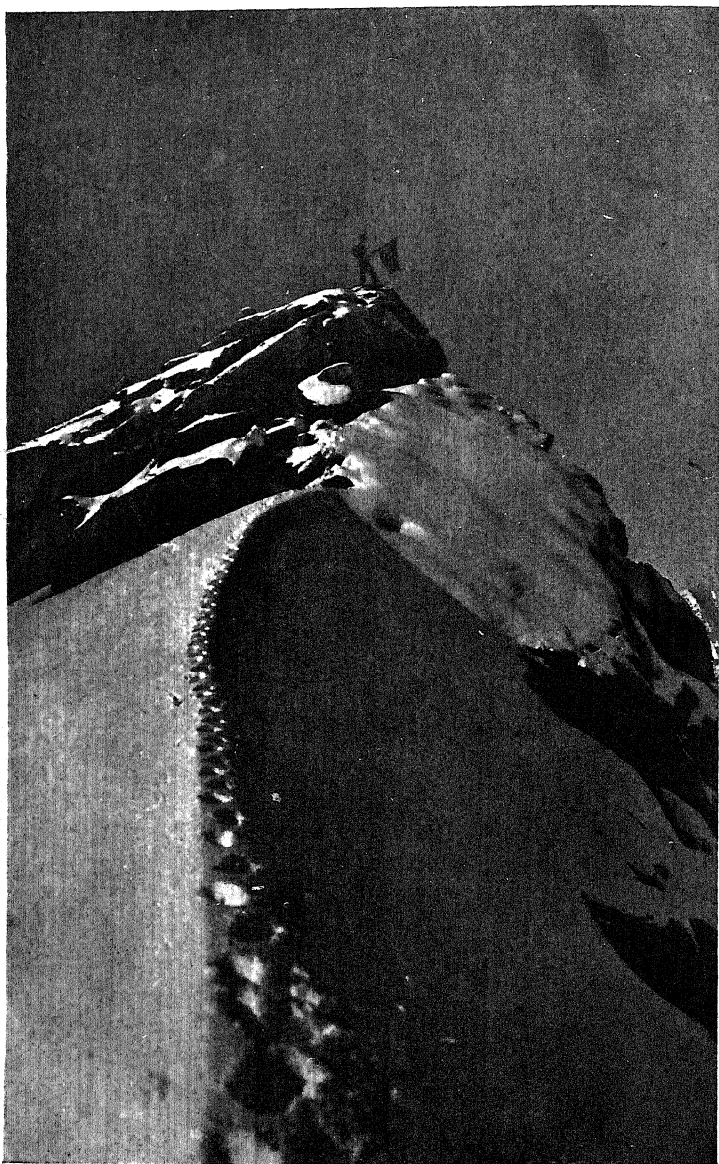
Compared to our lower climbs the slope here was ridiculously easy, but the work was hard, out of all proportion to the seeming difficulties. After slowly making a hundred steps we puffed like race horses on the home stretch, and were forced to stop and gasp for breath; another hundred steps and another gasp, and so on. We tried to pull ourselves together in a renewed compact to rise, but do what we could, cheer each other as we could, the thing seemed impossible, purely because of our inability to raise one foot above another. Our legs were of wood and our feet of stone. After prodigious efforts we were forced to camp at 18,400 feet with not enough energy left to talk or to eat.

The silk tent was pitched in a gathering basin under the shadow of the topmost peak and as we crept into the bags we were so reduced by frost and the awful breath-reducing struggles that we were but half conscious of the surroundings.

The circulation was so depressed that it was impossible to dispel the sense of chilliness. Increased clothing or bed-covers did not seem to make much difference. The best thing to dispel the shivers was hot tea. The alcohol-lamp was not a success at this altitude. But with a good deal of nursing we succeeded in melting snow enough for our drinks. The water boiled at a point so



IN THE SILENT GLORY AND SNOWY WONDER OF THE UPPER WORLD, 15,400 FEET



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THE TOP OF OUR CONTINENT

The summit of Mt. McKinley, the highest mountain of North America. Altitude, 20,390 feet

low that the tea was weak and never too hot. Indeed, if we desired the real flavour of the tea, it was necessary to eat the tea-leaves.

It was a restless and exciting night. Restless, because the task of breathing less than one half an atmosphere and pumping blood through collapsing arteries abnormally taxed our powers. Exciting, because with heaving, pulsating bodies we felt as if the end of life had come and the door of heaven was about to open.

This last night of the climb was one which we will long remember. We were not able to see anything with a normal perspective until long after midnight. Unable to sleep we were only permitted to rest in a semi-reclining position with shoulders raised, in which attitude the heart was eased and breath came and went with less effort.

We had to contend with a very difficult combination opposed to our comfort. With our strength reduced by the lower climb, with no reserve energy, with a low temperature to which were added the natural depressive effects of great altitudes, we were indeed much handicapped. Though the temperature was only 16° below zero, in its effects it was colder than 60 below at sea level. The shivers of this night with the pumping, thumping hearts and the spasmodic breath will always stand out as the worst torment of our endeavour.

Words did not freeze and tumble about us as did the words of Mark Twain's hero at the north pole, who found himself knee-deep in his own

eloquence, but as we raised the flap from our faces we did find ourselves nose-deep in the frost of our own breath.

We believed this to be our last camp but the outcome of our final assault was not at all a hopeful one. In a critical examination of ourselves we found that all of the pleasurable sensations had merged with the strain of the terrible task of climbing, but there was still the mechanism of duty which pushed us upward. The courage born of inspiration, the enthusiasm arising from anticipation, and all of the spirit of the joys of the pioneer ascent had been put into the slavish bent to press one foot above another to the summit.

CHAPTER XIV

TO THE TOP.—THE WORLD IN WHITE AND THE HEAVENS IN BLACK

LONG before dawn we rolled out of the sleeping bags, crept out of the tent, and then placing the robes about our shivering shoulders we studied the brightening blue of the topmost pinnacle of the Alpine North Pole. I never saw a more impressive spectacle. The peak loomed up like a giant mountain in the curiously deceptive light before dawn. In reality it was but two thousand feet above our camp, a mere fraction of the altitude of the great mountain, but in our enfeebled condition the peak appeared as high and as difficult as the entire uplift from the first camps. As the darkness merged into twilight the sky brightened, but as the sun rose the sky darkened and the cold increased.

With numb fingers and teeth chattering we packed our sleeping bags and a light emergency ration in the rucksacks and then with a grim determination we started for the culminating peak. The sun soon rose far above the green lowland beyond Mount Hayes and moved toward the ice-blink caused by the extensive glacial sheets north of the

St. Elias group. Our route was over a feathery snow-field which cushioned the gap between rows of granite pinnacles. During most of this part of the ascent we were in frosty shadows where the cold pierced to the bone, but when we did rise into the direct sunbeams there was a distinct warm sensation. Ten yards away, however, in another shadow, the air was as cold as during the polar night. The sunbeams seemed to pass through the air without leaving behind a trace of heat, similar to the effect of an electric spark through space.

A magnificent spread of an other-world glory ran in every direction. A weird world in white, with stars fading in gloomy blackness. Far below were milky waves of clouds and still farther down ugly gaps of indigo into which the vapours settled to their last resting-place. At the present writing I am tempted to enlarge on the awe-inspiring grandeur of this scene, but at the time we were too miserable to spend even visual energy on mere scenic effects.

An advance of twenty steps so fagged us that we were forced to lean over on our ice-axes to puff and ease the heart; another twenty steps and another rest, and so on in a life-racking series of final effort.

The last few hundred feet of the ascent so reduced our physical powers that we dropped on to the snow, completely exhausted, gasping for breath. We had gone so near the limit of human

endurance that we did not appreciate the proud moments of the hard-earned success. Glad enough were we to pull the eider-down robes about us, and allow our thumping, overworked hearts, as well as our lungs, labouring in less than half an atmosphere, to catch up. We puffed and puffed, and after a while the sickening thump under the left fifth rib became less noticeable. Breath came and went easier, and then the call of the top was again uppermost. It was an awful task, however, to pick ourselves up out of the deep snow and set the unwilling muscles to work pulling up our legs of stone. The mind was fixed on the glitter of the summit, but the motive force was not in harmony with this ambition.

Just below the summit we dropped over an icy shelf on the verge of collapse. After a few moments we gathered breath and courage and then for the last stage the life line tightened with a nervous pull. We edged up along a steep snowy ridge and over the heaven-scraped granite to the top. AT LAST! The soul-stirring task was crowned with victory; the top of the continent was under our feet. Our hands clasped, but not a word was uttered. We felt like shouting, but we had not the breath to spare. The thing that impressed me first was the noble character of Edward Barrille, the bigness in heart and soul of the man who had followed me, without a word of complaint, through hopelessness to success; and then after several long breaths the ghastly un-

reality of our position began to excite my frosted senses.

Curious experience this. It was September 16th, the temperature 16 degrees below zero, the altitude 20,390 feet. The Arctic Circle was in sight; so was the Pacific Ocean. We were interested mostly, not in the distant scenes, but in the very strange anomaly of our immediate surroundings. It was ten o'clock in the morning, the sky was as black as that of midnight. At our feet the snow glittered with a ghastly light. As the eye ran down we saw the upper clouds drawn out in long strings, and still farther down the big cumulus forms, and through the gap far below, seemingly in the interior of the earth, bits of rugged landscape. The frightful uncanny aspect of the outlook made us dizzy. Fifty thousand square miles of our arctic wonderland was spread out under our enlarged horizon, but we could see it only in sections. Various trains of morning clouds screened the lowlands and entwined the lesser peaks. We could see narrow silvery bands marking the course of the Yukon and the Tanana, while to the south, looking over nearby clouds, we had an unobstructed view. Mt. Susitna, one hundred miles away in a great green expanse, was but a step in the run of distance. The icy cones of the burning volcanoes Redoubt, Illiamna, and Chignik, the last two hundred miles away, were clearly visible with their rising vapours. Still farther the point of Kenai Peninsula, and beyond, the

broad sweep of the Pacific two hundred and fifty miles away!

A record of our conquest was, with a small flag, pressed into a metallic tube and left in a protected nook a short distance below the summit. A round of angles was taken with the prismatic compass. The barometers and thermometers were read, and hasty notes jotted down in our note-book. Most impressive was the curious low dark sky, the dazzling brightness of the frosted granite blocks, the neutral gray-blue of space, the frosty dark blue of the shadows, and, above all, the final picture which I took of Barrille, with the flag lashed to his axe, as the arctic air froze the impression into a relief which no words can tell.

The descent was less difficult, but it took us four days to tumble down to our base camp.

Dokkin, during our absence having grown enthusiastic about the chances of gold and copper mining, asked to be grub-staked. We had food enough for one man for a year, and left this with our companion to seek his fortune in the newly explored regions. The *Bolshoy* descended the river quickly and, taking the scattered parties from the Susitna Station on the next day, we pushed on to Tyonok, and to Kenai, and from there southward by the regular steamers.

APPENDICES

APPENDIX A.

SKETCH OF GEOLOGY OF MT. MCKINLEY REGION

BY ALFRED H. BROOKS

THE western part of North America is traversed from south to north by a mountainous region known as the cordillera. This cordillera runs parallel to the Pacific shore line, trending north-westerly through the United States and Canada and then, after entering Alaska and near the one hundred and fiftieth meridian, curving to the south-west around the Gulf of Alaska. This great bend is the topographic reflection of underlying bed rock flexures. It is here that the bed rock terranes, which have maintained a north-westerly direction throughout North America, turn to meet north-westerly structures which, geologically speaking, belong to Asia. At this meeting point between rock trends of the old world and the new lies the Alaska Range, and almost at the hinge line rises the huge dome of Mt. McKinley.

The Alaska Range—aptly named inasmuch as it is the most magnificent range of the Territory—stretches northerly from an unexplored region about Lake Clark to the latitude of Mt. McKinley, then bends north-easterly, and skirting the south-

ern margin of the Tanana Valley, finally, through its subordinate spur, the Nutzotin Mountains, merges with the St. Elias Range near the head of the White River.

The crest line of the range, about ten thousand feet above sea-level, strikingly even and well-defined, lies close to its western margin, where the mountains fall off abruptly to a gravel-floored plateau which slopes to the Kuskokwim and Tanana valleys. Eastward (from the crest line) the mountains descend more gradually to the Susitna lowland. The maximum width of the range is some sixty miles, while the crescentic axis has a length of about five hundred.

The higher peaks are domes with precipitous walls, while the connecting crest lines are sharp, with steep descents. The drainage is mostly carried eastward through steep-walled valleys, or often actual canyons. Throughout the high mountains the upper reaches of the drainage channels are buried in glacial ice, from the névé fields filling the glacial cirques at the heads of the valleys. On the coastal side the glaciers reach well down toward the Susitna lowlands, but on the inland side they are far less extensive, reaching only to the margin of the gravel plateau already referred to.

The component strata of the Alaska Range include various types of sedimentary rocks which were laid down at different periods, some at least as early as the older Paleozoic, others as late as the older Tertiary. During the past ages some



CLOUDS AND CLIFFS, 13,000 FEET

Climbing and camping during gloomy days and frosty nights in storm-driven clouds



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SCENE OF GLACIERS, PEAKS AND CLIFFS
Shoulder of Mt. McKinley, a cliff of 8,000 feet. Ruth Glacier, a freight carrier of the cloud world. The Great White Way, where
the polar frosts meet the Pacific drift of the tropical dews

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volcanic lavas have been poured out in this region, and large masses of granitic rocks were also injected as igneous masses into the sedimentary strata.

This geologic province, embracing the Alaska Range, is one where the earth's stresses have manifested themselves in many ways: by close folding and fracturing of the strata, by intrusions of igneous rocks, or by movements which have elevated or depressed extensive areas, at one time exposing a land surface to erosion by bringing it above sea-level, at another permitting the deposition of sediments by depressing it below sea-level.

Like most areas of high relief, these mountains are the result of the interaction of erosion on areas of uplift; that is, a province in which the destructive agencies of erosion have not kept pace with the constructive process of uplift.

The following sketch of the geology is based largely on my own and Mr. L. M. Prindle's observations in 1902 along a route of exploration which traversed the range at the head of the Kichatna and then followed the base of the mountains north-easterly to the Tanana River. Free use has also been made of the work of other members of the Geological Survey in adjacent areas, and of the notes furnished by Doctor Cook's party. Manifestly, only the barest outline can here be presented, but a fuller report is in preparation, which will embody a more detailed study of the field notes.

In the first of the following sections the succession of the various rock strata will be presented, chiefly, for the sake of brevity, in tabular form. This will be followed by a discussion of the present attitude of the sedimentary beds, under the heading "Structure." Then, after a brief consideration of the sequence of geologic events, this sketch will close with a summary of the mineral resources, under the caption "Economic Geology."

SUCCESSION OF ROCK STRATA

The first step in the discussion of the geology of any given province must be the presentation of the succession of rock strata. All sedimentary rocks have been derived from material originally laid down in horizontal beds on the floor of an ocean or other body of water. Such deposits are of two general types: (1) deep sea sediments, in which calcareous matter derived from organisms dominates; (2) shallow-water sediments which comprise clays, sands, and gravels derived from the erosion of near-by land masses. The accumulation of sediments, though a relatively slow process, measured in geological time, goes on very rapidly. Thus, during one of the minor geologic subdivisions of the past, thousands of feet of strata may accumulate, while the deposits of a larger subdivision, such as the Paleozoic, may attain a thickness to be measured in miles.

If the sediments remain undisturbed the more deeply buried beds become altered to hard rock

solely by the physical changes wrought through the blanketing effect of the superimposed strata. More often, however, this change to hard rock is accelerated by crustal movements which disturb the strata. Such movements are also often accompanied by the upward injection into the sediments of molten rock masses from the abyssal regions. Both the crustal disturbances and the injection of igneous rocks produce more or less chemical and physical changes in the sediments, and this change is termed "metamorphism."

By the processes described above the sediments laid down as calcareous matter, mud, sand, or gravel become altered to hard rock such as limestone, slate, sandstone, and conglomerate. If these changes continue long enough, or the agencies are intense enough, limestones are changed to marble, and slate and other rocks to schists, thus becoming what are termed "metamorphic rocks."

It has been shown that igneous intrusives, which consolidated at depth, may form an integral part of a geologic succession. The same is also true of volcanic rocks, comprising those of igneous origin consolidated at the surface. Such volcanics, including various types of lavas as well as tuff (volcanic ash), may subsequently become buried under later strata and subject to the same processes of alteration as the sediments. If the metamorphism is intense enough then lavas may be changed to schists which are difficult to distinguish from altered sediments. The same holds

true of the deep-seated igneous rocks, and thus a granite may be altered to a schist.

The component rocks of the Alaska Range are the products of the above-described processes of sedimentation, intrusion, volcanism, and alteration which have been operating through a long period of time, extending back at least as far as the early Paleozoic. Some of these agencies have continued to be active to the present, but the youngest strata which have become indurated belong to the early Tertiary.

It is not to be supposed, however, that the sediments of the Alaska Range form an unbroken succession of strata deposited in the same ocean. As a matter of fact there were recurrent periods of movement which altered and deformed the strata deposited in any one epoch, many of which brought the rock above sea-level as land masses and thus inaugurated periods of erosion. These periods of erosion, which furnished the sediments for the sedimentary rocks of other areas, were in turn followed by submergence and the recurrence of sedimentation. Epochs of erosion, which afford an important clue to the geologic history of a province, are made evident in the rocks as now exposed by the discordance of the beds of different formations, and then are termed "unconformities."

The strata involved in the dynamic revolutions which have given birth to the Alaska Range vary in age from a belt of schists, which probably belong to the lowest member of the Paleozoic, to rocks which are known to be Tertiary. Fossils, which

yield the only definite clue to the age of strata, have been found at only a few localities in this province, but so far as the evidence goes it indicates the presence of Ordovician, Devonian, Jurassic, and Eocene beds. The study of the succession of strata furthermore points to the conclusion that among the unfossiliferous rock, whose age has not been established, pre-Ordovician, Silurian, and Triassic strata may be represented. The general stratigraphic sequence is shown in the following table, which undoubtedly will be modified when more detailed studies have been made.

GENERALISED TABLE OF STRATIGRAPHIC SEQUENCE IN ALASKA RANGE.

	LOCALITY	
QUATERNARY	Throughout the province, but most extensively developed along the base of range.	Silts, sands and gravels (in part of glacial origin).
	Unconformity.	
TERTIARY (EOCENE) (Fragmentary plant remains)	Lower part of Cantwell River basin. Tyonok and along Skwentna River.	White, friable sandstone and conglomerate, with lignite seams.
	Unconformity?	
TERTIARY OR CRETACEOUS? (Fragmentary plant remains)	Upper part of Cantwell and Kantishna river basins.	Indurated red and brown conglomerate, sandstone, and shale, with some coal seams. Some volcanics of undetermined age, but known to be post-Jurassic.
	Unconformity.	
JURASSIC (Middle Jurassic invertebrate fossils)	Heart of Alaska Range.	Compact, feldspathic sandstone, grits, slates, and some limestones with some intrusive granites.

Note some slates occur infolded with this series which may belong to an older formation.

GENERALISED TABLE OF STRATIGRAPHIC SEQUENCE IN ALASKA
RANGE—*Continued*

TRIASSIC?	Unconformity. Skwentna Valley	Intrusive, igneous rocks, volcanics, with some slates and black limestones.
CARBONIFEROUS?	Unconformity? Inland front of range.	Heavy quartz conglomerate intimately associated with the Devonian limestone. It may be younger or older.
DEVONIAN (carryina middle- Devonian fossils)	Unconformity Inland front of Alaska Range.	Blue silicious limestone, with some slate.
DEVONIAN or SILURIAN	Conformity? Inland front of Alaska Range, and probably also slates of the Susitna Valley.	Cherty blue and black limestone, black shales, white, red and green cherts, and gray slates, with some augen gneisses which are probably altered lavas.
ORDOVICIAN (carrying graptolites)	? Kuskokwim Valley	Black carbonaceous shales and limestones.
PRE-ORDOVICIAN	Unconformity? Part of upper Cantwell and Kantishna river basins.	Mica-schists with some greenstone and granites intrusive.

STRUCTURE

The term structure, as here used, refers to the attitude or lay of strata in space, and their relative position, such as those which make up the Alaska Range.

In presenting an analysis of bed rock structure, it must be noted that during the past geological ages there have been a number of periods of fold-

ing in this province, and that, therefore, the present attitudes of the terranes is the final result of several crustal movements. Lack of detailed studies makes it impossible to differentiate to any considerable extent the structures of the various periods of stress, but in sketching the sequence of geologic events below these will be briefly touched upon. It is proposed to consider here the present attitude of the bed rock strata irrespective of the period of deformation to which they may be assigned.

The "strike" or "strike line" of a formation is the intersection of the bedding planes of the terrane with a horizontal plane. In a region of complex folding the strike often varies from place to place, but the dominant structures usually follow a well-defined system, and generally where there is strong relief these are parallel to the major topographic features. Such is the case in this province. In the southern part of the range the strikes are usually about north and south, while to the northward they gradually swing eastward until at the eastern end of the range they are nearly east and west. In other words the major strike line, like the axis of the range, is crescentic in form.

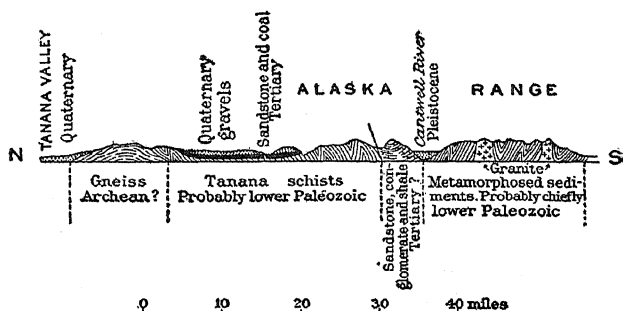
The "dip" of the strata is the inclination of their bedding planes with the horizontal. While in this discussion the absolute angle of dip is of small importance, its direction is essential to a comprehension of the structure of the strata—for the direction of dip along a line at right angles to strike

indicates whether the fold is an arch or a trough, the first being called a syncline, and the second an anticline.

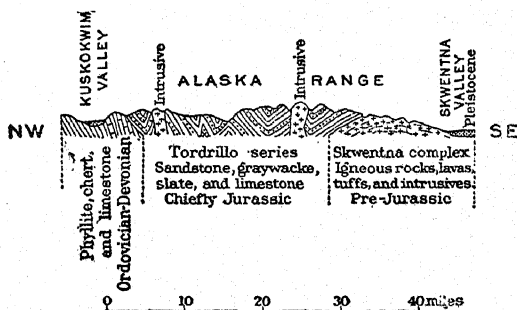
So far as known, the dominant structure of the range is synclinal; that is, the terranes on both sides of the mountains dip toward the axis. As a necessary corollary, the oldest infolded rocks are found near the margins of the mountains, and the youngest near the centre. This is the dominant feature along one route of exploration across the mountains, and appears also to hold true in the section exposed between the Susitna and the Tanana along the Cantwell River. This fold is, however, not simple, but complex, as indicated in the accompanying sketch which shows that there are a number of smaller folds within the larger syncline; in other words, it is what is known as a "synclitorium." Could a section be drawn on a larger scale and in more detail, still greater complexities of structure would be brought out. For this discussion, however, it will suffice to state that the range has a general synclinal structure.

When a rock stratum is folded beyond its tensile strength, fracturing takes place, usually accompanied by more or less displacement. This phenomenon, called "faulting," is of common occurrence in closely folded rocks, and may introduce many complexities into the structure. There are many ways in which rocks may be broken and pushed over each other, depending chiefly on the position of the plane along which dislocation

has taken place. "Overthrust faults" are those in which an older stratum has been thrust over a younger stratum. Such thrust faults are usually exceedingly difficult to identify unless detailed studies have been made, and if not recognised may lead to faulty conclusions as to the stratigraphic succession.



GENERALISED SECTION THROUGH ALASKA RANGE ALONG VALLEY OF CANTWELL RIVER



GENERALISED SECTION ALASKA RANGE FROM SKWENTNA RIVER TO KUSKOKWIM RIVER

While traversing the Alaska Range Mr. Prindle and I noted many examples of minor faulting where the dislocation varied from a few inches to

several hundred feet. We also obtained some evidence of more extensive faulting with throws which may amount to several thousand feet. In the absence of detailed studies these larger faults must remain to a large extent hypothetical. Along the inland front of the range many of the strata are overturned to the west, and here there can be no doubt that more or less overthrust faulting has taken place. It is not improbable that the whole of the west front of the range is determined by a series of extensive overthrust faults.

Another phase of disturbance is that which accompanied the intrusion of the large masses of igneous rocks. These masses, called "stocks," composed of granite rocks, are usually of lenticular outline and often many miles in length. Their injection necessarily disturbed the adjacent sedimentary beds. While the metamorphic effect, that is the chemical and physical changes brought about by the introduction of large masses of molten magma, appears to have been very localised, yet the mechanical effect on the adjacent strata was considerable. It also appears that there has been more or less movement along walls which bound these lenticular stocks, since the magma solidified to their present form; in other words, that there has been faulting along these margins. Such movements probably in part account for the fact that Mt. McKinley and Mt. Foraker, both of which are granite masses, stand so high above the crest line of the range.

To sum up briefly, the structure of the Alaska

Range is that of a synclinorium broken by many minor and probably also by some larger faults. Thrust faulting has taken place along the western arm of the syncline, probably accompanied by very considerable dislocation of strata, measured in thousands of feet if not in miles. Some of the granitic stocks in the range are in part bounded by faults of considerable throw, which are parallel to the larger axis of the intrusion.

The origin of such deformation is usually ascribed to tangential movements of the earth's crust which have resolved themselves into a thrust from one general direction. This tangential pressure probably came from the ocean basin and acted against the continent. That is, there was probably a land mass inland of the present range which acted as a buttress and against which the rocks were squeezed by a thrust from the Pacific. It cannot be too often repeated that this disturbance was not confined to any one period of the past, but recurred at different times and with varying intensity.

OUTLINE OF GEOLOGIC HISTORY

The most important clues to the age of geologic strata are the remnants of organic forms, which are preserved in them as fossils. Using these criteria alone, a sketch of the succession of events by which the Alaska Range has been formed must begin with the deposition of the strata in which Ordovician fossils are known to

occur, for these are the oldest organic remains yet found within the province. It is known, however, that, even long before that distant epoch in geologic time termed Ordovician, deposition of thousands of feet of sediments and volcanic rocks, followed by folding, intrusion, and metamorphism, took place. The metamorphic rocks of this older epoch, exceedingly difficult to differentiate and classify, even where they occur in the best known parts of the earth's surface, become well-nigh impossible of intelligible description and discussion in a field like this, much of which has not been explored.

Whatever the detailed investigations of the future may bring forth, it is certain that there is a belt of highly altered rocks, both sedimentary and igneous, stretching along the north-western front of the Alaska Range, in part forming a series of foothills, in part buried under later accumulations of Tertiary strata or recent gravel deposits. These rocks, first laid down as sand, clay, and mud, were later deeply buried under superimposed strata, intruded by large masses of igneous rocks, and then intensely squeezed. These agencies brought about a complete change, amounting in certain cases to an almost entire recrystallisation of their constituent minerals. While there is no direct evidence of the age of these rocks, from what is known of similar formations in adjacent areas it is probable that they were deposited during Cambrian or pre-Cambrian times. In any event the dynamic revolution which altered

them took place before the deposition of the rocks carrying Ordovician fossils. In the foregoing table these mica schists and intrusives are, therefore, indicated as of pre-Ordovician age.

Though the contact relations of these crystalline rocks and the Ordovician terranes has not been established by field observations, they are without doubt those of unconformity. That is, the older crystalline rocks were folded and uplifted above the sea floor, exposing them to erosion, before the deposition of the Ordovician terranes.

Fine sediments, such as slates and limestones, characterise the Ordovician deposits throughout Alaska so far as recognised. This indicates that they were laid down as deep sea sediments, and justifies the assumption that the northern and western half of Alaska was beneath the sea during Ordovician times. In the province here discussed the only evidence of life during this period are the delicate and obscure organisms called graptolites.

No evidence has been found of any interruptions to the deep sea conditions, during the succeeding epoch, termed Silurian and Devonian, though for a time the character of the sediments was different, inasmuch as cherty or argillaceous deposits dominated over the limestones. In middle Devonian times calcareous sediments again dominated, and the sea of this period was known to teem with organic life. These organisms, now preserved as fossils, are in part mollusks of various descriptions,

in part corals, the latter indicating a gradual shoaling of the waters.

The succession after middle Devonian times again becomes obscure. A heavy quartz conglomerate, believed to be of Carboniferous age, is abundant along the western front of the range. The deposition of this probably followed a period of uplift deformation followed by erosion; that is, it marks an unconformity. If these facts are correct there was probably a land-mass here during late Devonian or early Carboniferous times which contributed coarse sediments. As shown, however, in the table of sequence, this conglomerate may be older than the fossiliferous Devonian limestone; but, in any event, it indicates such an abrupt change in sedimentation as to make it probable that there was a marked change of physical conditions.

In the Yentna basin, on the eastern side of the range, we crossed a broad belt of volcanic rocks, with which were associated some sediments, which are probably of Triassic age. This group of rocks indicates an outburst of a large number of volcanoes whose outpourings, including both lava and tuffs, probably in part submarine, continued until many thousand feet of material was piled up. Igneous activity finally spent itself, but it left a land mass above water. Erosion then began and probably continued long enough to bring about the levelling of the more rugged features of the topography. In early Jurassic times erosion was interrupted by a submergence, and conse-

quent invasion of the sea, which inaugurated an epoch of sedimentation. It appears from the character of the sediments, which are chiefly slates, sandstones, and conglomerates, that the sea was shallow, and that there was a near-by land mass which furnished the material laid down in the strata. The thickness of these strata amounts to many thousand feet, and the fossil remains show that in part these rocks were laid down during Jurassic times.

The close of this period of deposition was marked by one of the recurrent epochs of deformation. Gravels, sands, and clays became conglomerates, sandstones, and slates, which in turn were closely folded and faulted. During this period of earth movements large masses of igneous rocks were injected in the deep-seated portions of the earth's crust. This intrusion was a part of one of the greatest dynamic evolutions of the continent, for it was then that the great intrusion of granite which is now exposed in the Sierra Nevada and in the Coast Range of British Columbia and Alaska took place. It also appears that the ore-bearing mineral veins of south-eastern Alaska and probably of other regions were injected during or immediately following this intrusion.

The sedimentary terranes in the Alaska Range assigned to this epoch are the youngest which suffered any considerable metamorphism, the latter strata probably never having been so deeply buried, or so closely folded. It seems probable that at the close of this epoch there was a con-

siderable part of what is now Alaska above water, and that much of this part of the continent had essentially its present shore line. The Aleutian chain had probably not been uplifted, however, and the sea probably washed both slopes of the Alaska Range, while a great gulf of the ocean occupied the lower parts of the Kuskokwim and Yukon basins.

The next younger group of sediments comprises sandstones and shales, with some conglomerates, occurring along the north-west flank of the mountains. These sediments indicate shallow-water conditions, as do also some lignitic coal seams associated with them. Some volcanic rocks are included in these sediments. These sediments were folded and elevated above the sea probably in early Tertiary times, and then in a large part removed by erosion. In any event, while these sediments have a thickness of at least two thousand feet, they now occupy only a small area in the northern part of the field. This group of rocks is the youngest which has been considerably folded. Though the beds have not been highly altered, yet they stand at high angles, and their structure is far more complex than a later group of rocks to be described. It appears, then, that the last extensive period of deformation took place just after these sediments were laid down, and that all subsequent movements were of the character of broad uplifts and depressions, which as a rule, left no record in the individual strata. It is of great importance to determine the age of

this last great period of crustal disturbances, but the evidence is scant. It appears probable from analogues in adjacent areas that it falls in the early Tertiary.

The last wide-spread epoch of deposition is represented by some loose conglomerates, friable sandstones, and shales, together with some lignite beds, which occur in widely separated areas throughout the province. The nature of these sediments indicates their deposition in river valleys and lakes or possibly, in part, in estuaries. The epoch of deposition which they mark was separated from previous epochs by a long period of erosion during which the rugged topography inherited from the preceding cycle was to a large extent removed and land reduced to a lowland. Across the lowland rivers meandered, and probably it is their deposits which are preserved in the sediments described above.

In middle Tertiary times a general uplift took place, which inaugurated the present cycle of erosion, though it has probably been interrupted by some minor depressions. This uplift, though intermittent, finally left the range at approximately its present altitude. It should be remembered, however, that erosion has considerably reduced the relief. This movement was differential and the highest peaks, such as Mt. McKinley and Mt. Foraker, were probably uplifted far above adjacent parts of the range. Their altitude is, however also due to the fact that these peaks are made up of hard granite which has

resisted the agencies of erosion more than the associated sediments.

Though a minor incident in the geologic history, the glaciation which followed this uplift has played an important part in carving out the present topographic forms. During the glacial epoch the Alaska Range, as well as the other highland masses of this part of the continent, became the loci of accumulations of ice and snow which forced themselves out into the lowlands as huge ice-sheets, lowering the valley floors over which they passed. On the south the ice-sheet filled Cook Inlet and discharged into the Pacific, while on the north it spread out across the Tanana Valley and into the Kuskokwim basin. These glaciers not only removed the loose material over which they swept, but in many instances ground deep channels in the underlying rock floor. Finally, for reasons not well understood, the ice began to retreat, and as it retrograded the accompanying floods carried vast amounts of *débris*, and deposited it as great sheets along the mountain fronts and in the lowlands. The fast disappearing remnants of these greater ice-sheets are still preserved in the present glaciers of the Alaska Range. As the amount of *débris* furnished by the ice decreased, the streams began cutting channels in these gravel sheets, an action which was accelerated by minor uplifts of the land.

The retreat of the ice and the dissection of the gravel deposits left the topography in essentially its present form.

ECONOMIC GEOLOGY

It will not be possible to discuss in any detail the mineral resources of the province, but a few general notes may be not without interest.

Within the Alaska Range proper no economically valuable minerals have yet been discovered, nor does the outlook for such discovery appear very hopeful. Placer gold has been found in workable deposits in the Yentna Basin within the foothills along the southern margins of the mountains, and some auriferous gravels, but not of known economic importance, are also known to occur along some of the other westerly tributaries of the Susitna. Gold placers have also been worked in a small way in the Kantishna. These placers lie in the so-called Kantishna and Bonnifield districts. The auriferous gravels that have been worked both south and north of the mountains are shallow deposits and the gold is found chiefly on bed rock. In the Yentna district the bed rock is said to be chiefly slate, probably of Paleozoic age, while in the Kantishna district the country rock is chiefly mica schists (pre-Ordovician) similar to that with which the gold is associated in the Fairbanks district. Besides these shallow auriferous deposits, some of the heavier gravel beds are known to carry a little gold, but whether it is in sufficient quantities to yield returns by any of the improved mining methods must be left to the future to determine.

This placer gold was derived from the quartz

veins or mineralised zones in the country rock with which it is associated. The presence of workable placers does not necessarily indicate that the bed rock source of the gold will be found to carry sufficient values to yield returns on exploitation. For the richness of the placers may simply be the result of long-continued process of sorting by agencies of weathering and erosion, which have brought about the concentration in the gravels of the heavier minerals separated from the bed rock.

One feature of the geology of the Alaska Range is favourable to the occurrence of mineral deposits, and that is the presence of the granite intrusives already described as having been injected in Jurassic times, for it is known that in other parts of Alaska ore bodies are found in close association with these granite stocks. The following quotation¹ from a recent report bears on this question:

“It is safe, therefore, to assert that the intrusion of the Mesozoic granite in many parts of Alaska was accompanied or followed by the formation of auriferous veins. It is important, therefore, to draw attention to the distribution of this rock. As shown by Mr. Wright, it not only forms the major portion of the Coast Range, but also finds a wide distribution in isolated stocks among the islands to the west. The main granite mass passes into Canadian territory in the Chilkat basin and has been traced northward to Kluane Lake,

¹ Brooks, Alfred H., and others. Progress Report. Investigation of Alaskan Mineral Resources. *Bull. U.S. Geol. Survey*, No. 314, 1907, p. 25. .

where, too, evidence of mineralisation is found. It occurs again in the form of dikes and stocks along the northern margin of the Copper River valleys and has been recognised at a number of places in the Alaska Range to the south-west.'

The above theoretical consideration would seem to warrant a continuation of prospecting along the margins of these granite masses, in spite of the fact that the associated rock so far as examined appears to be barren of any ores.

Coal is the only other mineral deposit yet found in this province. Lignite seams are not uncommon associates of the younger sediments of the region, but most of these have only a very remote commercial importance. The lignites of the upper Cantwell River are probably the only ones which may be exploited in the immediate future and that only because they lie within thirty to fifty miles of the town of Fairbanks, which affords a good market for fuel. The lignites of the southern side of the range can probably not be mined at a profit, even if rendered accessible by railway, because they would come into competition with the high-grade coals of the Matanuska field, which lies nearer the coast.

APPENDIX B.

BIOLOGICAL DATA AND SPECIMENS COLLECTED BY CHARLES SHELDON

AT about the same time that the south-eastern slopes were being explored by us with the aid of our horses, Mr. Charles Sheldon pushed southward from the Tanana River along the Kantishna to the northern slopes of Mt. McKinley, his mission being mainly to study mountain sheep. He had but one assistant and their supplies were transported by pack horses. After leaving Hanna Glacier a course was set along the same route taken by our party in September, 1903. The grassy slopes above timber at an altitude of from three thousand to four thousand feet offered good travelling. Passing Muldrow Glacier he followed Lecointe River into Dunn Basin where mountain sheep in great numbers were found. Mr. Sheldon made a valuable collection of mammals which he presented to the Biological Survey. Descriptions following are by Wilfred H. Osgood.—F. A. COOK.]

STONES CARIBOU

Rangifer Stonei Allen

On his way in to the base of Mt. McKinley about the middle of July, Mr. Sheldon saw many

caribou, but it was then too early to secure specimens with perfect antlers, so he planned to get them on his way out, but on the return trip not an adult male was seen. However, he secured in Tanana a pair of locked antlers which had been found near the head of the Cosna River. These seem referable to *R. Stonei*. One of them has a considerable part of the skull attached, including nearly perfect tooththrows. The length of the tooththrow is 104 mm. Measurements of the antlers are, respectively, as follows:

Length main beam (along side) 1090, 1265; greatest spread between palmations 710, 570; greatest spread between bez tines 645, 665; circumference of beam between brow and bez tines 152, 136; number of points in palmations 10—8, 3—3; number of points in bez tines 7—8, 4—3; number of points in brow tines 7—4, 7—1; total number of points 44, 21.

ALASKA MOOSE

Alce Americanus Gigas Miller

A few moose and numerous signs were seen in the vicinity of the base of Mt. McKinley and near the mouth of the Toklat, but no specimens were preserved. They are abundant throughout the timbered part of the region, to which, however, they are not confined, as they frequently traverse open country.

DALL SHEEP. WHITE SHEEP

Ovis Dalli Nelson

Seven specimens, six adult males and one (skull)

adult female, taken August 10-30. Indefinite reports have been current to some extent to the effect that the sheep of Mt. McKinley and the Alaska Range were larger or smaller or otherwise different from the other Alaskan sheep. Such reports seem to be groundless, for the specimens are identical with those from the Kenai Peninsula, referable to *Ovis Dalli*. The skins are practically pure white, but careful search reveals a very few dusky hairs here and there on the back and a very small and mostly concealed proportion of them on the tail. The pelage is entirely new and rather full and long but shows considerable brown earth stain. The skulls and horns do not appear to differ in any important respect from those of typical *Ovis Dalli*. The region seems to be a great stronghold of the white sheep, but although hundreds of ewes and lambs were seen almost daily, rams were found only in very small numbers after long and determined hunting.

RED SQUIRREL

Sciurus Hudsonicus Erxleben

Common in all the timber.

GROUND SQUIRREL

Citellus Plesius Ablusus Osgood

Eight specimens, mostly adults, from the base of the Muldrow Glacier and the head of the Toklat River. These are typical examples of *ablusus*, and thus carry its range considerably to the north-east, the nearest point from which it was previously known being the head of Lake Clark.

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HOARY MARMOT

Marmota Caligata (Eschscholtz)

One specimen, a very fine old female, killed on the Peters Glacier, one of the few good adults of this species now in collections from the interior of Alaska.

BEAVER

Castor Canadensis Kuhl

Of rather rare occurrence, in interior ponds only. No specimens.

DAWSON RED-BACKED MOUSE

Evotomys Dawsoni Merriam

Two specimens, both from the wooded region at the mouth of the Toklat.

ALPINE VOLE

Microtus Miurus Oreas Subsp. nov.

Type, from head of Toklat River, Alaska Range, Alaska. No. 148,596 U. S. National Museum, Biological Survey collection. ♂ ad. August 8, 1906. C. Sheldon. Original No. 47.

Characters.—Similar to *M. miurus*, but tone of colour more ochraceous (not so yellowish) throughout; tail slightly shorter and chiefly ochraceous, slightly or not at all darker above than below.

Colour.—Type, in worn pelage: Upperparts and sides pale ochraceous buff or clay colour somewhat toned down on back by a slight mixture of dusky and exposure of the plumbeous bases of the hairs; underparts uniform pale ochraceous buff; feet

creamy buff; tail pale ochraceous buff with very faint traces of dusky on upper side.

Skull.—Very similar to that of *M. miurus* but somewhat narrower; braincase more elongate; zygomatics less flaring anteriorly.

Measurements.—Type and one topotype, respectively: Total length, 125, 120; tail vertebræ, 20, 19; hind foot (dry), 19.2, 19. Skull of type: Basal length, 26.7; basilar length, 23.9; mastoid width, 11.4; interorbital constriction, 3.4; nasals, 7.4; maxillary tooththrow, 6.

Remarks.—Seven specimens of this vole were secured in the high mountain meadows near the head of the Toklat River. Two of these are adult males and the remainder immature, but the entire series is characterised by a richer and more reddish colouration than that of typical *miurus*, of which specimens in exactly comparable pelage are available.¹ The tail is even shorter than in *miurus* and with little or no dark colour on the upper side. The slight cranial characters noted above may not prove constant. The form doubtless occurs throughout the higher parts of the Alaska Range and this is probably the extent of its distribution, for collecting in the mountains near the Yukon River and in the northern Rockies has failed to reveal it or any near relative.

Since Mr. Sheldon's trapping was chiefly confined to the region above timber line, this was the

¹ The Biological Survey series of *M. miurus* being quite small, specimens from the American Museum of Natural History, kindly loaned by Dr. J. A. Allen, have also been used for comparison.

only species of *Microtus* taken. Some or all of the following probably occur at somewhat lower altitudes in the region: *M. operarius*, *M. drummondi*, *M. mordax*, and *M. xanthognathus*.

MUSKRAT

Fiber Spatulatus Osgood

Common about ponds in the less elevated parts of the region.

PORCUPINE

Erethizon Epixanthus Myops Merriam

Occurs throughout the timbered part of the region. No specimens.

COLLARED PIKA

Ochotona Collaris Nelson

Five specimens, three from near the Peters Glacier, taken July 28th, and two from the base of the Muldrow Glacier, taken August 2d. All are typical of this species, which doubtless occurs in suitable places on all the high mountains of the interior of Alaska. Mr. Sheldon reports that pikas were abundant in the vicinity of his camps.

DALL VARYING HARE

Lepus Americanus Dalli Merriam

Hares were seen in abundance well down in the timber but no specimens were secured.

CANADA LYNX

Lynx Canadensis (Kerr)

Common where rabbits are to be found. One was killed on the Tanana River but was not preserved as a specimen.

NORTHERN WOLF

Canis Albus (Sabine)

Wolves are abundant, chiefly above timber, where many tracks were found.

FOX

Vulpes Fulvus Subsp.

Very abundant, especially above timber. Several were seen, including black or nearly black individuals. No specimens.

GRIZZLY BEAR

Ursus Horribilis Phaeonyx Merriam

Six grizzlies were secured, three adult females and three cubs, the latter being the offspring of one mother. They show much variation in colour, especially the cubs, one of which is very pale, another very dark, and the third almost exactly intermediate. All were killed high up on the mountain slopes far above timber, to which region they seem largely confined. The name "Glacier Bear" is locally applied to light coloured examples of this grizzly.

BLACK BEAR

Ursus Americanus Pallas

A black bear was seen on the Kantishna River and many tracks were noted in various parts of the timbered region, where the animals are evidently very abundant.

OTTER

Lutra Canadensis (Schreber)

Otters occur in limited numbers. No specimens.

MINK

Lutreola Vison subsp.

Common. Several were seen along the Kan-tishna and Tanana rivers and numerous skins were seen in the possession of trappers on the Toklat.

MARTEN

Mustela Americana Actuosa Osgood

Common throughout the timbered part of the region. Trappers' skins seen on the Toklat were noted as being light coloured and therefore probably represent the subspecies *actuosa*.

WOLVERINE

Gulo Luscus (Linnæus)

Common throughout the region, except in the timberless belt, and doubtless also to be found there. Skins were seen among the trappers on the Toklat.

SHREW

Sorex sp.

No specimens of shrews were secured, but that they occur is attested by the fact that the remains of one were found in the stomach of a bear. Those of probable occurrence are *Sorex personatus arcticus*, *S. obscurus*, *S. tundrensis*, and *S. eximius*.

APPENDIX C

THE COOK INLET ABORIGINES

BY CHARLES SHELDON

THE aborigines living along the shores of Cook Inlet and the Susitna River have in their veins much Russian blood. Originally these were the Kodiaks, Kenites, Knicks, and Susitnas. These tribes were usually friendly to each other and united to defend themselves against the Copper River Indians and the Eskimos. In language, in folk-lore, and in their implements there is considerable similarity, but a distinct tribal organisation has been maintained with a chief, a second chief, and other assistants. The combined population of all the existing villages is about three hundred, but when the Russians first came to the Inlet they found on the bluff about the present site of Tyonok an estimated gathering of twenty thousand Indians.

Though these Indians have been close to big game areas, where bear, moose, mountain sheep, and caribou were abundant they never have been great hunters, mostly because fish in abundance have been too easily gotten. By judicious use of nets they have been able to obtain in a few weeks enough salmon to supply their wants for a year.

The fish is dried and smoked and packed in caches elevated on spikes where the larder is out of reach of the dogs and wolves and bears. Thus subsisting on fish their primitive life was easy, but with the advent of the Caucasian their troubles increased rapidly. A market was found for their skins, an appetite was created for bread, sugar, tobacco, and other things. A fashion was set for clothes and the hunter was forced to work overtime to supply the new wants.

It is to-day a very difficult task to separate the different tribes whose hybrid descendants have intermingled to form the sad groups that remain as Cook Inlet aborigines. The intermarriages have always been to near relatives; first cousins are commonly married. In the old days there was a certain amount of wife stealing. One tribe would descend on another, destroying the men and capturing the women and children; thus there was much admixture of blood. But since the time of the Russians this has not been permitted. Russians, however, have freely married Indian women, and have gone away later and left half-breed families. Miners and traders have done likewise. Some have remained, others, tired of their surroundings, went away. In either case the effect has been to distribute Caucasian blood among aborigines that at least have a close resemblance to the Mongolian stem. The result of all this has been to scatter various types of men in Alaska. There are the Eskimo Indians, the Russian Indians,

the Mongolian Indians, and the various indescribable shades of colour and degrees of blood admixture.

The necessity to make alliance to protect themselves from the Eskimos and the Copper River Indians or the whites has long since passed. The rapid extermination of these primitive people is not to be ascribed so much to alcohol, bad habits, and civilised sins as is generally supposed, but to virulent epidemics of imported disease.

The death-knell of these Indians, as of most of the aborigines of the world thus far, has been the introduction of new disease germs to which the vigorous savage was an easy victim because his red blood was not charged by the protective serum which ages of misfortune have left us as a heritage.

The most fatal element has been the rapid introduction of diseases of childhood. For centuries we have unconsciously developed a kind of mild immunity to measles, scarlet fever, whooping cough, and other children's diseases which has enabled us to withstand epidemics. But these diseases were new to the Indian. Old and young are carried away so rapidly that few tribes ever survive a prolonged wave of this type of maladies, which to us would be of little consequence.

The Susitna Indians place the origin of man near Mt. McKinley, and the raven as the creator. At a point along Indian Creek Pass from which the Susitna and Chulitna valleys can be seen,

and the great slopes of Bolshoy pierce the clouds, the big peak marks the beginning of the world; here man first began his existence, and from here he spread to the utmost reaches of the earth; the Kenites, the Alouts, the Copper River tribe, the Kodiaks, and others are but offshoots of the original parent stem made by the raven near Mt. McKinley. The Indian seldom tells this in these days, but a miner asked one about a lot of suspicious bones and bits of skin which he saw at Indian Creek and he was promptly told that here even to this day the raven made Indians, and that these bones were the leavings. The raven selected bones from other animals, shaped them for the type of man he wished to make, then put on the soft part and the skin last. An Indian will not visit this workshop of the raven.

The children are put through a very severe course of training to fit them for the duties of later life. At the age of six the boy is turned over to one of his uncles for his first schooling. Little sleep or food is allowed the child, and he is kept busy at hard work. Cold water is thrown over the boy to harden his muscles, beginning at his feet and gradually increasing the splashing to his head by regular stages with advancing years. At about ten years he is thrown into cold deep water and forced to learn how to swim. He sleeps on the floor with little or no covering, is made to go out in winter without clothing to cut wood, and in many ways the boy is forced to endure

hardships with a view of an ultimate development of physical strength and powers of endurance.

Girls are compelled to undergo a less severe training to fit them to domestic duties, but they are kept under close watch. After twelve years they are not allowed to leave their homes alone.

In the qualifications for marriage, the young man must have proven his ability to hunt and fish. He must also have shown a faculty to devise implements of the chase. Men usually marry when about twenty years old and as many times thereafter as they can steal women from neighbouring tribes, the supplementary wives becoming slaves. The girls were marriageable at sixteen years. There was no visible courtship. The young man asked the father of his prospective bride. When his consent was given a big assemblage of the relatives and friends of both sides was called. At the meeting two men were selected to give away the couple, and to deliver orations on the advantages and disadvantages of the coming union to the tribe and to the respective families. Then followed much other talk bearing on the subject introduced by the speakers. The boy was presented first to the bride and then the girl to him. They met on a caribou skin and in the presence of all were acknowledged as man and wife. Then followed a great feast with hilarity, singing, and dancing. Some presents were made to the parents of the girl and the new couple assumed the responsibility of helping their parents

on both sides in case of need, but the wife's family fared best.

The older chiefs have always had special privileges and like many old men they have a special fondness for young girls. Thus it is not an uncommon sight to see a very old man with a very young wife. The preliminary arrangements for these young wives take on the form of barter. An old chief sees a girl he admires and while his old spouse is still living and with her knowledge and consent he bargains for the girl as his future wife. The girl may be a mere child or she may be near marriageable age. For consideration the chief usually agrees to protect or help in some way the parents. This may be material assistance, food or implements, or it may be spiritual help to assure good luck on the hunt, to dispel an evil spirit, or it may be protection against an enemy. The girl in barter spends her time between the two houses, and gets her education accordingly. The saddest type of this barter was that of an old blind chief; he had been blind for a long time, and he was anxious for a partner with a similar distress. He secured a young girl, pierced her eyes when very young, and then trained her to become his helpmeet.

For shelter skin tents have always been in use. During the stone age a house of wood and sod similar to the Eskimo igloo was in use, but since the time of the Russians and iron implements a big log hut, or *barabra*, has been generally adopted.

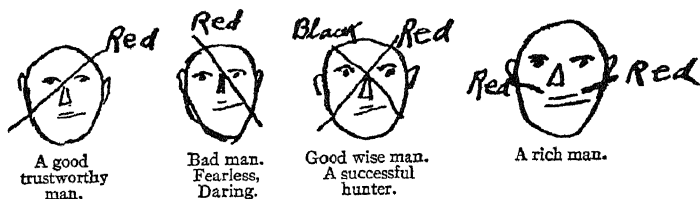
The barabras now at Kroto and other places are about eighteen feet square, constructed of logs, with gable roof in which a big slit is left in the centre for smoke to escape, and long fireplaces on the floor to one side. Originally there were raised floors like that of the Eskimo hut with people sleeping above and below, on skins or brush. Several families lived in one of these barabras and they were in former times made much larger. An indispensable annex was the *banyel*, or bath house; a place of about the same shape as the barabra, with a window of bear intestine in one corner. There was a pile of round stones, *preferably not too large*. These were heated on burning logs in the barabra and piled up. Men, women, and children would go into the banyel, some one would splash water with bunches of brush upon the hot stones, and with a hiss from the stones and a yell from the people the room would be filled with steam. When thoroughly warmed and heated, some one would take the bunches of brush and vigorously strike his neighbour; thus a strong perspiration was produced which was their remedy for all diseases.

The original implements of the chase and the knowledge of them have passed away with the old aborigines. The same is true of most of the arts of life. For transportation the dog sled and the bark or skin canoe are to-day in use, but the bow and arrow, the lance, and the old fishing nets and baskets are seldom used.

Girls had their faces ornamented with tattoo

marks when they were about ten years old. The ink was made from rotten birch wood. Thereafter the girls were carefully guarded by their mothers, never being allowed away from home alone. A non-virtuous girl was deprived of her home and became an outcast.

Among the men a line of distinction was painted on the face. The colour was red and black. The red paint was made of burnt rock and the black of burnt clay.



The Cook Inlet people in the pre-Russian times burned their dead. Logs were cut in appropriate sizes and piled in tiers in such a way that a draft ran upwards directing the fire. The body was placed on the logs face upwards or in a sitting position. Friends took turns in piercing the abdomen with sharp sticks to allow the spirits to escape, and a good deal of attention was required to keep the fire hot, for the freedom and rapidity with which a body burned was supposed to be an indication of the favour in which the departed was rated by their supreme spirit, Nah-cri-tah-ny. The ashes were gathered, placed in a box, and stored in a corner of the provision shack. For one

year the near relatives mourned by chanting doleful songs.

In the case of the death of a beloved wife, the husband would cut slits in his skin along the front of his arm and draw through the wound eagle's feathers, moving the feathers occasionally, and thus keeping the wound open for one year.

One year after a man's death the nearest relatives called a meeting of all of those known to have had dealings with the deceased during life, and to them in the presence of a large gathering, all of the personal belongings were distributed as presents, as well as much new material donated by relatives. After this the name of the departed was not mentioned and he was forgotten.

In the spirit world they place one supreme being named Nah-cri-tah-ny, who is regarded as the maker and creator of all things. There are many lesser spirits under the direction of the great spirit. Among these is the god of the lakes, and the god of the mountains. The lake god assumes the form of a big fish and he is supposed to be destructive, inflicting punishment upon evil-doers and destroying those who disturb him in his haunts. The mountain god is regarded as a protector, helping the Indian in his troubles and guiding him to good hunting and fishing grounds. If an Indian ventures into the high mountains and appeals to the spirit, he is supposed to be received cordially and is given direct advice for his future conduct.

APPENDIX D

RAILWAY ROUTES IN ALASKA *

BY ALFRED H. BROOKS **

TRANSPORTATION is the first essential element to the industrial advancement of a new land. Therefore, though the subject of railway location may be of no great academic interest, there lies a justification for its discussion in the fact that it is of such vital importance to those who are developing the resources of Alaska. Moreover, the matter is timely because of its relation to a broad question of public policy, for many efforts have been made in recent years to obtain financial support from the federal government for Alaskan railway projects.

Popular interest in this subject appears to be only excelled by popular ignorance of it—an ignorance, too, which is constantly being augmented by misstatements in current literature. Some years ago the assertion was made in a magazine article that some parts of Alaska were being rapidly gridironed by railways. To those familiar with

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** Geologist in charge of Alaskan Division, U. S. Geological Survey.

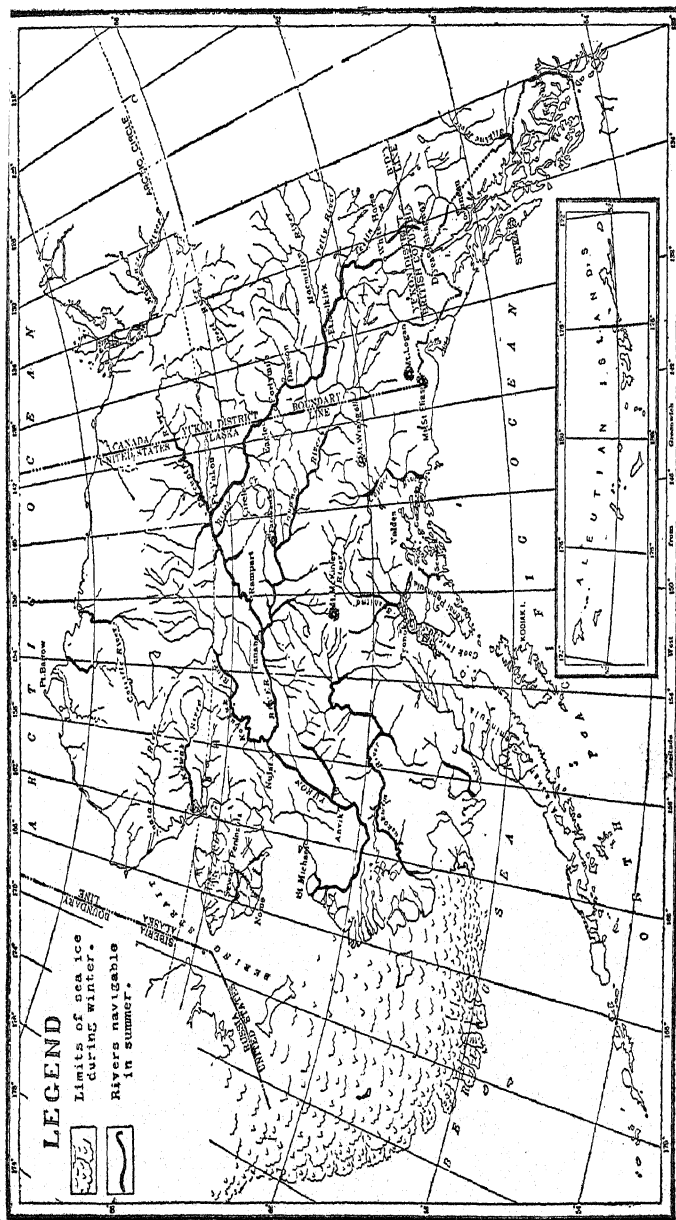
the primitive condition of transportation maintaining throughout the territory, such a statement can appear little short of ridiculous. This misleading article has, however, evidently been regarded as authoritative, for it has found place in a popular encyclopædia.

Though the aggregate mileage of railways in Alaska is less than 200, but little more than that of Porto Rico, this is divided among eight different lines. Of these, four are along the Pacific seaboard, three on the Seward Peninsula, and one in the Tanana Valley. All of these railways have been built to supplement water transportation. (See map, page 281.)

RAILWAY LOCATION

In the discussion to follow of the principles governing railway location, I will confine myself entirely to commercial lines, for obviously railways built for military or scenic purposes will follow routes determined by entirely different conditions.

The controlling factors of railway location fall into two important groups, here termed (1) commercial and (2) geographic, while in regions lying close to international boundaries a third, namely, political, becomes operative. Each of the first two groups resolves itself into several subordinate factors, one or more of which may dominate in any given province, to the practical exclusion of all the others. The following table is an attempt to



present a terse analysis of the problem of railway location:

I. *Commercial control:*

1. Developed resources (statistics of production and commerce).
2. Undeveloped resources.
 - Mineral (economic geology).
 - Agricultural (climate, soils, and botany).
 - Timber (distribution, quality, and quantity).
3. Population.
4. Competitive or supplementary lines of transportation (navigable waters and existing railways).

II. *Geographic control:*

1. Position (terminals and connecting lines of transportation).
2. Distances (comparison of distances of different routes).
3. Relief (mountain ranges, passes, and valleys, as affecting gradients).
4. Watercourses (depths and widths of rivers, as affecting construction of bridges or ferries).
5. Climate (precipitation, etc., as affecting cost of construction, operation, and maintenance).

III. *Political control:*

1. Political boundaries.

Before analysing this table I will forestall possible criticism by stating that certain elements which must of necessity have an important influence with a locating engineer are here entirely omitted because they do not appear to be germane to the subject. In this I refer more specially to the financial backing to any given project. Obviously the choice of a railway route may have to be governed by the low cost of first construction rather than by consideration of the ultimate economy in construction, operation, and maintenance. I believe, however, that the question of financing a railway project should find no place in a sci-

entific discussion of railway location. The available sources of material for construction have also not been included in this analysis, for this is, after all, a local problem and will not affect the general choice of routes.

What I have termed commercial control is simply another name for tonnage, the great dominating element in railway location. This, in turn, is dependent in a large measure on resources, developed or undeveloped. In settled regions the distribution of population may wield a decided influence, but population again is usually an evidence of developed resources. The amount of tonnage will also be affected by competitive and supplementary lines of transportation.

Five subdivisions are recognised under geographic control. The first is position, which pertains chiefly to location and character of terminals and their relation to other transportation systems. Under the second, distances, the different routes are compared in length. Under relief is included the influence of topography, while larger water-courses must be considered because they necessitate bridges or ferries. The influence of climate on cost of construction, operation, and maintenance is obvious. Heavy snowfalls, river floods, and the closing of waterways by winter ice are elements that deserve consideration. Political control obviously refers to international boundaries alone.

I have intentionally emphasised the commercial

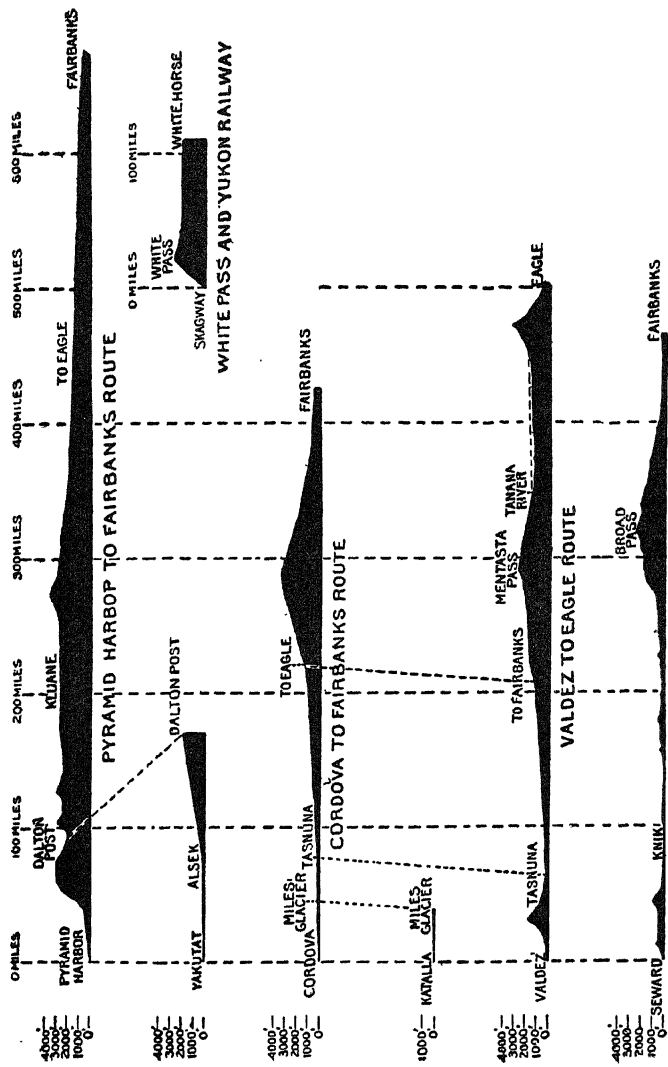
control of railway routes, for it is evident that without adequate tonnage railways cannot be built economically. On the other hand, given the resources to warrant the cost of construction and operation, and the modern engineer will build a railway almost anywhere. In this I do not intend to indorse the policy, too often followed, of railway location which is not preceded by comprehensive geographic investigation. Many railways have been based on routes chosen by the old adage: "The Indian followed the buffalo, the white man the Indian, and the locomotive the white man." As a consequence, nearly every transcontinental line has made or is contemplating changes of routes involving the expenditure of millions of dollars which might have been avoided by proper exploration and survey. The lesson has not yet been learned, however, for recently a corporation proposing to build a railway in Alaska, after spending several hundred thousand dollars in construction, abandoned the chosen route for another. In this case a tenth part of the money spent on what proved to be worthless construction would have more than paid for the necessary explorations and surveys.

It follows from the above that, while the demand for transportation between certain localities may be such that a railway will be built in spite of the physical obstacles, yet economic location demands the most careful adjustment to the topography.

COST OF CONSTRUCTION

Though it is not the purpose of this paper to discuss the more purely engineering aspect of my subject, yet it may be well to devote a few words to the question of the cost of construction because of the many current misconceptions regarding it. It will be pointed out below that the watersheds to be crossed by Alaskan railways vary from about 2,000 to 3,400 feet, which are low compared with the altitudes of 8,000 to 11,000 feet attained by many railways in the Western States. It will also be shown that the routes of approach to the divides have as a rule low gradients, and that much of the region to be traversed by railways is one of only moderate relief. On the other hand, most of the proposed routes will demand bridging of many streams and rivers. This feature will possibly be the most difficult for the engineer to contend with, because of (1) the winter ice and (2) the spring floods. (See profiles, p. 286.)

The chief factor which will much enhance the expenditures for railway construction in Alaska is the distance of the coastal terminal to the centres of population, for this increases the cost of all labour and materials. Shortness of the summer season and adverse climatic conditions will also enhance the cost. It has been estimated by a competent engineer that the same class of construction will cost 75 to 100 per cent. more in Alaska than in the Western States. The same



SEWARD TO FAIRBANKS ROUTE
 VALDEZ TO EAGLE ROUTE
 CORDOVA TO FAIRBANKS ROUTE
 PYRAMID HARBOR TO FAIRBANKS ROUTE
 GENERALISED PROFILES OF PROPOSED RAILWAY ROUTES

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engineer has stated to the writer that in many parts of the interior, where valleys and rolling uplands are followed, the cost of a standard-gauge railway will probably not exceed \$30,000 per mile, but through the coastal mountain ranges may be more than twice as great. Where detailed surveys and estimates are wanting, it will probably be safe to count on an average cost of at least \$35,000 per mile for a standard-gauge railway from the Gulf of Alaska to the Yukon.

RESOURCES TO BE DEVELOPED

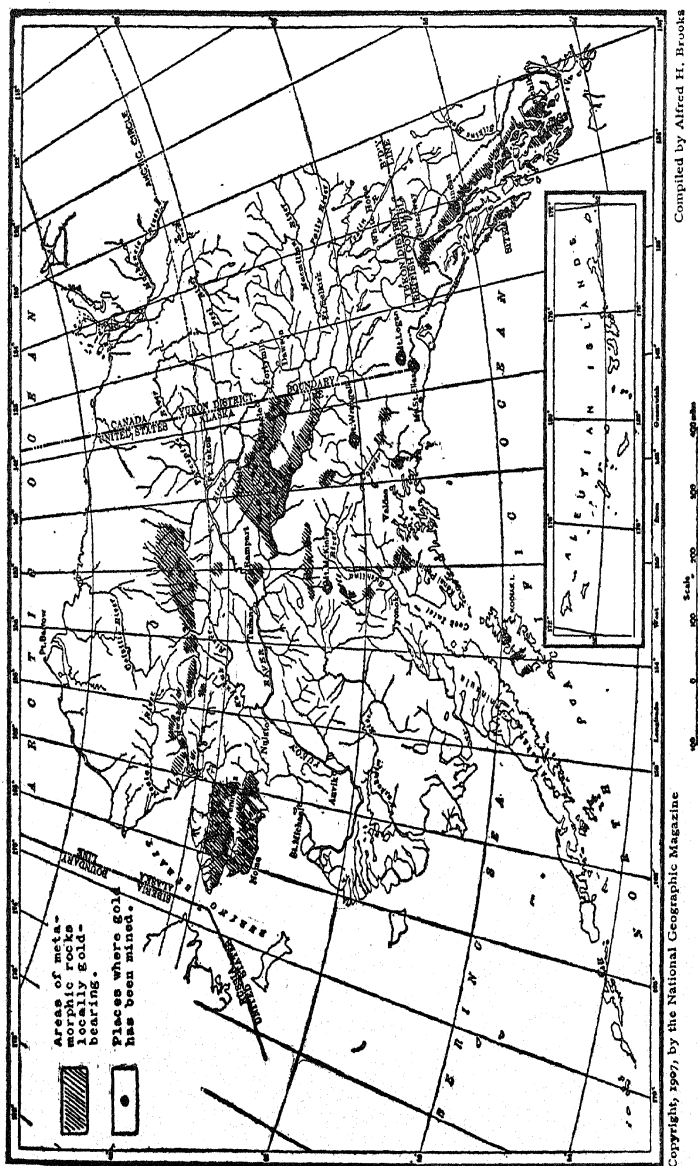
It is evident that a discussion of railway routes must consider the resources of the territory as well as its physical features; that is, on one hand the possibilities of traffic must be discussed; on the other, the routes of approach. The question of traffic again resolves itself into statistics of existing commerce and the foreshadowing of that to come from undeveloped resources.

In Alaska the problem is simplified by the fact that the immediately available resources to be developed by railway construction are all of a mineral character. I do not by this mean to decry the agricultural possibilities of certain parts of the territory, but I do believe that these may be almost neglected in the present discussion, for the reason that these arable lands are too remote from centres of population to yet compete with

the more accessible and fertile lands in the States. The capitalists will certainly look to the mines of precious metals and of coal to recoup themselves for outlays on railway construction. With the mining development some agricultural progress will unquestionably be made and eventually be a source of traffic for the road. There is no timber for export except along the Pacific seaboard. In fact, much lumber is annually taken into the interior, and this consumption is likely to become greater, if the present ravages by forest fires in the Yukon Basin continue.

Mineral Wealth

The discussion of resources to be developed by railways, therefore, resolves itself into a consideration of the mineral wealth and its distribution. In other words, it is a geologic problem. Though the basal facts are very incomplete, yet some salient features of the economic geology are known, and these bear directly on the problem of mineral resources. It is not my purpose to describe the geology of the Territory, but I will call your attention to the distribution of certain terranes which carry minerals of economic value. The rocks grouped together as undifferentiated Paleozoic, including the gold-bearing horizons, occur in three belts, one running parallel to the Pacific seaboard, a second lying centrally in the

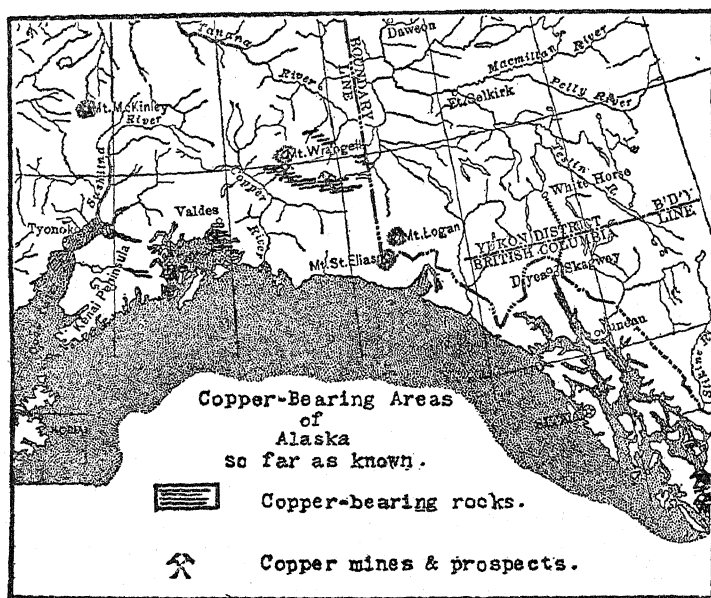


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MAP OF ALASKA SHOWING MT. MCKINLEY AND GOLD PRODUCING AREAS

Yukon province, and a third forming the country rock of the major part of the Seward Peninsula (see map, p. 289). Of the \$100,000,000 which represents in round numbers the total mineral production of Alaska, over 98 per cent. has been



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taken from areas underlain by these rocks. In south-eastern Alaska there is a well-defined contact between a broad belt of intrusives and these metamorphic terranes, and this has been proved to be the general locus of auriferous lodes. It should be noted that the northern extension of this contact lies in a little-known region, as will be

shown later; it is close to one of the proposed railway routes into the interior. Another fact bearing on the mineral resources can be interpreted in terms of geology. On either side of the Wrangell Mountains is a belt of Devonian rocks which are copper-bearing (see map, page 290). These are, indeed, the outcrops of the same terrane along two areas of a syncline and form the objective points of several railway projects.

The map on page 289 shows the distribution of the auriferous terranes of the territory so far as determined. It emphasises the fact that there is an extensive gold-bearing area lying well within the heart of the Territory and 400 to 500 miles from tidewater.

The total area of the known coal-bearing rocks in Alaska is approximately 12,000 square miles.* Unfortunately, much of the coal in the northern province is of a lignitic character, and, though it will eventually find local use, cannot now be regarded as an important source of tonnage for railways. There are two coal fields, however, the Controller Bay and Matanuska, aggregating at least 120 square miles, which carry high-grade bituminous and some semi-anthracite coal. This coal is superior to any mined on the Pacific seaboard of the continent and is suitable for metallurgical purposes. Both fields are objective points of railways now under construction, and are expected to furnish local tonnage for these roads,

* See map, page 296.

to be eventually extended into the interior. Bituminous coals also occur on the Yukon and at Cape Lisburne, on the Arctic Ocean.

Only the copper deposits of the inland region are important to this discussion, and these include two different districts lying north and south of the Wrangell Mountains, on the two arms of a syncline (see map, page 290). The southern belt, to which a railway is being built, has been sufficiently developed to indicate a large tonnage.

Agricultural Possibilities

I have shown that the resources which promise to yield a tonnage are gold, copper, and coal. The forests, except along the seaboard, have no value for export.* Inland the heavy timber, of which the largest trees are not over two feet in diameter, is closely limited to the river courses. Though there are sawmills in every placer camp of the Yukon, that these do not even supply the local demand is made evident by the fact that in 1905 upward of \$30,000 worth of lumber was brought to the Yukon from Puget Sound. The timber map can also be used to indicate the general distribution of arable lands, for the areas marked as timber embrace practically all the lands which may possess future agricultural value. A region lying adjacent to and north of Cook Inlet appears to be best adapted for agriculture, but in the Copper and

* See map, page 293.

Tanana basins, too, there are considerable tracts of agricultural and grazing lands. It should be borne in mind that beyond the coastal barrier the subsoil usually remains perpetually frozen and the climate is semi-arid. These conditions, combined with the shortness of the growing season and the liability of frosts, do not invite agricultural pursuits. Nevertheless, the conditions are no more adverse than those existing in some European countries which support a thrifty agricultural peasantry and export agricultural products. The richness of the soil is attested by the many gardens found throughout the inland region. These are specially successful where hot springs have thawed the soil.

STATISTICS OF MINERAL PRODUCTION AND COMMERCE

As regards the developed resources, little can be added to what has already been presented. The rapid increase in gold production is shown in the diagram on page 303. Including 1906, the total output of gold is about \$100,000,000, only about one quarter of which has come from the inland districts, as shown in the table on opposite page:

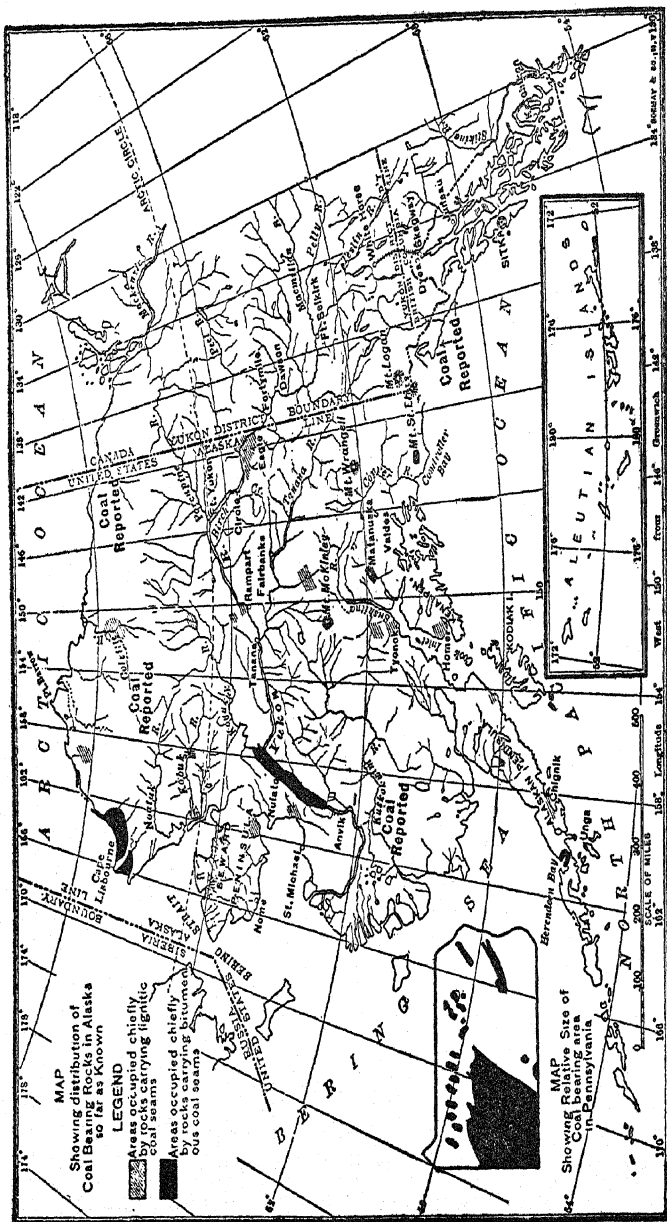
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GOLD PRODUCTION OF ALASKA, WITH APPROXIMATE DISTRIBUTION

YEAR	PACIFIC COASTAL BELT.	COPPER RIVER AND COOK INLET REGION.	YUKON BASIN.	SEWARD PENINSULA.	TOTAL.
1880	\$20,000	.....	.....	.....	\$20,000
1881	40,000	.....	.....	.....	40,000
1882	150,000	.....	.....	.....	150,000
1883	300,000	.....	\$1,000	.....	301,000
1884	200,000	.....	1,000	.....	201,000
1885	275,000	.....	25,000	.....	300,000
1886	416,000	.....	30,000	.....	446,000
1887	645,000	.....	30,000	.....	675,000
1888	815,000	.....	35,000	.....	850,000
1889	860,000	.....	40,000	.....	900,000
1890	712,000	.....	50,000	.....	762,000
1891	800,000	.....	100,000	.....	900,000
1892	970,000	.....	110,000	.....	1,080,000
1893	838,000	.....	200,000	.....	1,038,000
1894	882,000	.....	400,000	.....	1,282,000
1895	1,569,500	\$50,000	709,000	.....	2,328,500
1896	1,941,000	120,000	800,000	.....	2,861,000
1897	1,799,500	175,000	450,000	\$15,000	2,439,500
1898	1,892,000	150,000	400,000	75,000	2,517,000
1899	2,152,000	150,000	500,000	2,800,000	5,602,000
1900	2,606,000	160,000	650,000	4,750,000	8,166,000
1901	2,072,000	180,000	550,000	4,130,700	6,932,700
1902	2,546,600	375,000	800,000	4,561,800	8,283,400
1903	2,843,000	375,000	1,000,000	4,465,600	8,683,600
1904	3,195,800	500,000	1,300,000	4,164,600	9,160,400
1905	3,430,000	500,000	6,900,000	4,800,000	15,630,000
1906	3,500,000	400,000	10,000,000	7,300,000	*21,200,000
Total	37,470,400	3,135,000	25,081,000	37,062,700	102,749,100

*Production for 1906 is estimated.

The copper production, which in 1905 was valued at \$750,000, has so far been only from the coastal zone, and therefore does not affect this discussion. In 1905 4 tons of coal were exported from Alaska, as compared with 30 tons of gold, which strikingly indicates that the coal-fields have not yet been exploited. Several thousand tons



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MAP OF ALASKA, SHOWING THE DISTRIBUTION OF THE COAL-BEARING ROCKS, SO FAR AS KNOWN

Compiled by Alfred H. Brooks

are, however, mined annually for local use. It is worthy of note that both the Controller Bay and Matanuska coal-fields carry some excellent coking coals, and, if made accessible by railways, the mining of this character of fuel for smelting of the copper ores is likely to become an important industry. (See map, page 296.)

The custom-house statistics show that \$3,272,411 worth of goods were carried to the Alaska-Yukon from the United States in 1905, which probably represents between 15,000 and 20,000 tons of freight. The cost of the freight on this tonnage amounted probably to over \$1,200,000 to the consumer. This sum, allowing three quarters for operating expenses, would pay probably 5 per cent. interest on the cost of constructing 200 miles of railway, or half the distance from tide-water to the Yukon placer camps. I call attention to this to show that, even with the present condition of development, railway projects are not entirely visionary.

COMMERCIAL DEMANDS FOR RAILWAYS

The important mineral-bearing area of Alaska falls into four provinces, most of which are undergoing rapid development.* These are (1) the Pacific littoral, (2) the Seward Peninsula, (3) the Susitna-Copper River province, and (4) the Yukon-Tanana region. The Pacific littoral lies for the most part on tide-water, open throughout the

* See map, page 306.

year, and needs no railway system to develop it, though there are many places where short lines will eventually be built.* The Seward Peninsula, which in 1906 produced about \$7,300,000 worth of gold, is accessible to ocean-going vessels for fully a third of the year. These, with the 100 miles of railway already in operation and other projected lines, afford means of communication which, while it leaves much to be desired, is sufficient to enable large mining operations to be carried on.

Plans for the construction of the so-called New York-to-Paris Railway, across Alaska and Siberia, have found earnest advocates during the past few years. Though this project rather falls outside of the present discussion, yet it deserves mention, if for no other reason than for the publicity it has received. Alaska can obviously not be connected with the United States by rail except by a line through Canadian territory.† When the new Canadian transcontinental railway, known as the Grand Trunk Pacific, which is to reach to the Pacific coast in latitude 54°, is completed, a branch could be extended northward, which could reach Fairbanks with 800 to 1,000 miles of track. While such a line would not encounter any serious obstacles, yet many watersheds would have to be crossed, and as it would run transverse to the larger drainage channels there would be heavy expense for bridges. A railway from Fairbanks to Cape Prince of Wales would

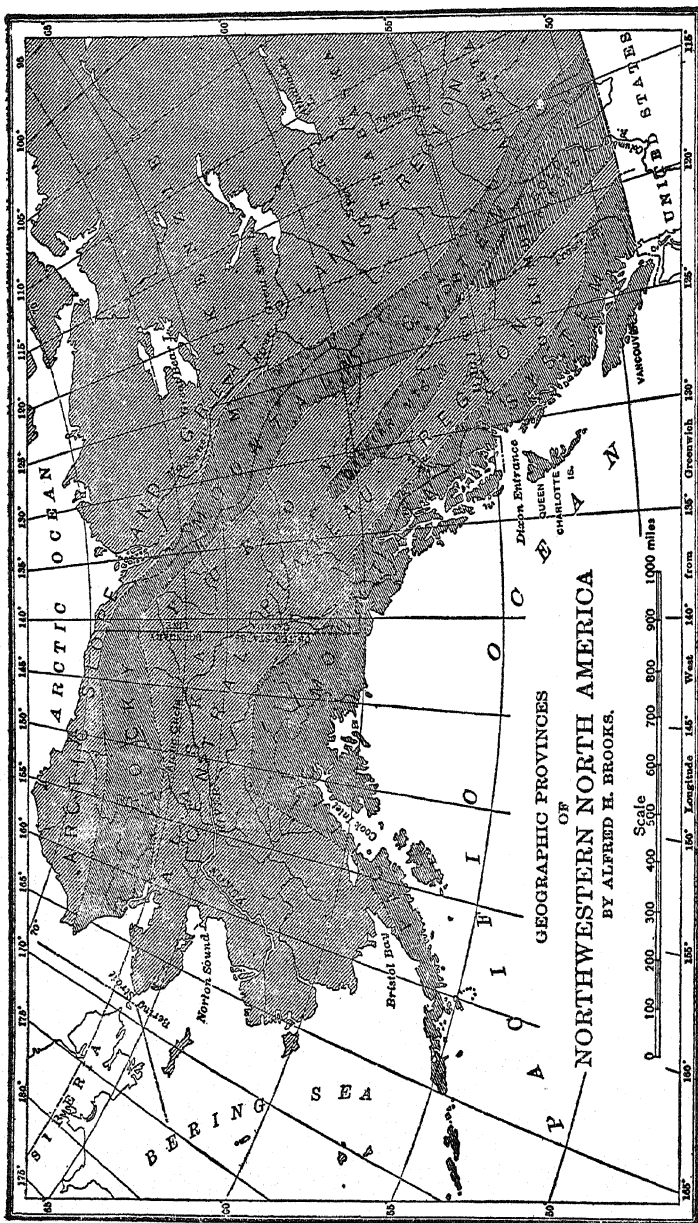
* See map, page 281.

† See map, page 300.

require at least 600 miles of track. It is proposed to tunnel Bering Strait, which is 54 miles from headland to headland, but is broken by the Diomed Islands, lying about half way between. While tunnels of the length required are probably not an impossible engineering feat, they are so far beyond anything of the kind as yet attempted that it must be a bold group of capitalists who would undertake it. Ferriage across the strait, difficult in summer because of the strong northerly-setting current, is impossible during seven or eight months in the year because of the ice-floes. As the strait seldom freezes over, communication without a tunnel would be entirely interrupted. (See map, p. 300.)

This intercontinental railway project, divested of its glittering generalities, amounts to this: The first 1,000 miles of track would parallel the Pacific seaboard and reach a point less than 500 miles distant from tide-water by a more direct route. An additional 600 miles of track would be needed to reach Bering Strait, and this, too, would be in direct competition with deep-water navigation for at least a third of each year. Furthermore, to connect the two sides of the strait, as proposed, would require two tunnels more than twice as long as any hitherto constructed. The Siberian part of the route would appear to have even less justification, for here 1,500 to 2,000 miles of unsettled and unproductive territory would have to be traversed.

Whatever the future may bring forth leading to a demand for railway connection with Seward



Peninsula, it is certain that there is at the present moment an urgent need for railways between the Gulf of Alaska and the inland region lying to the north.* Only by such railways can the copper and gold deposits of the Susitna and Copper rivers and the placer fields of the Yukon reach their full development. Here is an area about 400 miles square, bounded on the east by the international boundary, on the north by the Arctic Circle, on the west by the 154th meridian, and on the south by the Pacific, which contains, as has been shown, valuable copper deposits, the best of the known Alaskan coal-fields, as well as extensive areas of auriferous gravels. Good grass land is abundant and cattle-raising can probably be profitably carried on to supply the local market, which is sure to arise with mining developments. The agricultural values, though of interest to the economist, will probably be disregarded by the capitalist, who will look to the development of mines for returns on his venture. Certainly without the ore and coal deposits there would be no railways, and without these there will be no agriculture until more accessible regions are settled.

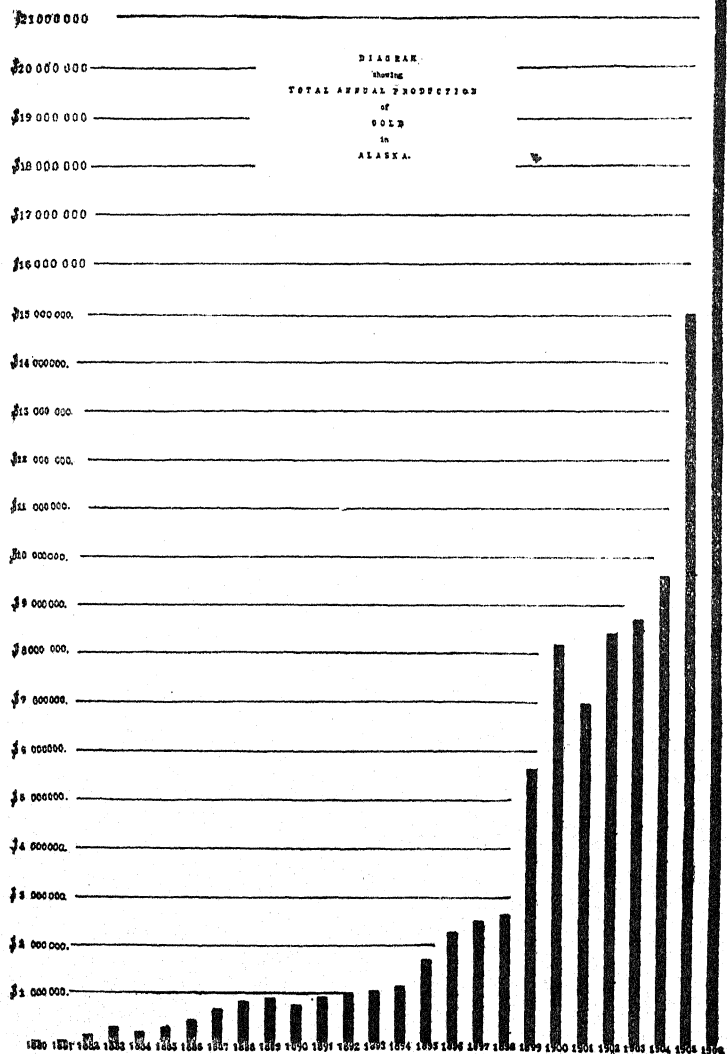
Though now the annual mineral output of this province is only about \$10,000,000 in gold, there appear to be great possibilities in the way of mining developments, provided it can be made accessible to commerce.

The mining districts of the Susitna-Copper River

* See map, page 306.

province are only accessible by an overland journey of 100 to 300 miles, for the rivers which empty into the Pacific are for the most part torrential in character and but few are navigable. All the supplies for these districts have to be sledded in during the winter months, at a cost of 10 to 20 cents a pound. The charges for summer transportation by pack-horse are from 30 cents to a dollar a pound.

In the Yukon Basin conditions are somewhat more favourable, because of the extensive system of navigable waters. Before the freight reaches the Yukon, however, it has to make a circuitous route to the mouth of the river, open to navigation only from the end of June to September. During summer months Yukon River steamers can deliver freight to points 20 to 100 miles distant from the placer districts. This freight must await the winter snow before it can be finally sledded to its destination, unless the summer charges of 20 to 25 cents a pound are to be paid. Under these conditions, freight which is moved by the cheapest form of transportation (by steamer in summer and sleds in winter) costs the miner from 5 to 10 cents a pound, delivered at his mine. Translated into terms more familiar to the average man, this means that the mine operator may have to pay a rate on all his heavy machinery equivalent to the charges for express between New York and San Francisco. In fact, I have known mining enterprises to be carried on in localities to which the transportation



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THE INCREASING GOLD PRODUCTION OF ALASKA

charges were greater than letter-rate postage. Under such conditions it is evident only deposits of extraordinary richness can be exploited, and that most extensive mining operations must await the reduction of costs that can be brought about only by the construction of a railway. (See map, p. 281.)

GEOGRAPHIC CONTROL

Having set forth the facts which go to indicate that the resources of central Alaska are sufficient to warrant the construction of a railway, it is in order to consider the question of geographic control of routes. It has been shown that the present demand for transportation facilities is in the province lying between the international boundary and the 154th meridian, and this district will here alone be considered.* The rugged mountain mass skirting Alaska's southern border presents a serious barrier to inland travel. This zone, including a number of parallel ranges forming the Pacific Mountain systems of Alaska, but 50 miles in width at Lynn Canal, broadens out to the north-west, and at Cook Inlet attains a width of over 200 miles. Inland of this system lies another province of far less relief, which has been termed the Central Plateau region. The drainage of this central region is carried, for the most part, to Bering Sea through the Yukon River, while the waters of the Pacific Mountain province flow southward and through the Chilkat, Copper, Susitna, and smaller

* See map, page 300.

rivers to the Pacific. One river alone, the Alsek, finds its source in the Central Plateau region, and traverses that entire Pacific Mountain system on its way to the sea. Obviously the valley of the Alsek is from a topographic standpoint the only logical railway route into the interior. It will be shown, however, that the commercial and political factors are so adverse in case of the Alsek Valley as to appear to rule it out.

Besides the valleys of the larger rivers, already mentioned as flowing into the Pacific, there are a number of low passes breaking through the mountain barriers. Among the most important for the present discussion is the White Pass (2,800 feet), a break in the Coast Range north of Lynn Canal, across which a railway has already been built. At the head of the Chilkat River, whose valley separates the Coast and Saint Elias ranges, there is an unnamed pass about 3,100 feet high. West of Lynn Canal the coastal range represents an almost unbroken front, except for the Alsek and Copper River valleys. At the inland front of the Saint Elias Range the Alsek Valley has an altitude of about 2,000 feet, and is connected with the drainage basin of the White River to the west by a pass but 2,400 feet high. (See profiles, page 286.)

Low River, which empties into Valdez Inlet of Prince William Sound, is separated from the Copper River by Marshall Pass, about 1,900 feet high. At the head of the Copper there are several passes leading into the Tanana Valley, of which

the lowest is called Mentasta (3,000 feet), and the next, which is unnamed, connects the Gulkana and Delta valleys. Both of these passes are through the eastern end of the Alaska Range, and one or the other will be used by any railway built from the Copper basin into the Tanana Valley.

It will be evident from the matter presented that commercial control limits the choice of inland railway routes to the region lying between Lynn Canal on the east and Cook Inlet on the west. Topographic control, furthermore, limits the choice to four general zones, which may be named after the chief rivers, whose valleys determine the location. These are named from south to north: (1) the Chilkat basin, (2) the Alsek basin, (3) the Copper basin, and (4) the Susitna basin. (See map, page 306.)

Harbours

The first requisite for an inland railway from the Gulf of Alaska is an adequate coastal terminal. This means not only a deep-water harbour, but also opportunity for construction of wharfs, as well as a town site near at hand. Other desirable, though not absolutely necessary, conditions are available timber, water power, and a favourable climate. If possible, the harbour should be accessible to sailing as well as steam vessels, and the routes of approach should be devoid of dangers to navigation; but, beside all these desirable attributes, the distance of the coastal terminal to

the points of shipment on the west coast of the United States is of first importance.

The recent geological history of the Pacific shoreline of Alaska is favourable to the formation of harbours, for it is a glaciated region, and, as many have shown, glaciation produces fiorded coast-lines. This is, however, only true where sedimentation subsequent to glaciation has not silted up and smoothed out the coast-line. The first condition prevails in south-eastern Alaska and on Prince William Sound, where the coast is characterised by deep fiords with many tributary embayments. In the intervening region the retreat of the larger ice-sheet left many large glaciers on the coastal slope of the Saint Elias Range and in the Piedmont belt, and these, having access to bed rock along their margins, have contributed a large amount of sediment. This sediment has been deposited as extra-glacial material and has buried much of the fiorded coast-line. Therefore the physiographic features make south-eastern Alaska or Prince William Sound the most favoured localities for coastal terminals. (See map, page 300.)

Other factors have to be considered. Lynn Canal is a superb deep waterway, but its funnel shape causes it to be subject to severe wind-storms, and it is therefore not favourable for sailing vessels. The same holds true, in a less degree, of the upper part of Prince William Sound. Resurrection Bay, which penetrates the mainland to a much shorter distance, affords an almost ideal harbour. Though

the shore-line between south-eastern Alaska and Prince William Sound is not favourable for harbours, yet two indentations, Yakutat Bay and Controller Bay, furnish some protection for vessels. (See maps, pages 306 and 310.)

In the comparison of distances it will be convenient to use Puget Sound as a reference point. Lynn Canal is less than 1,000 miles (statute) from Puget Sound, as compared with 1,150 for Yakutat Bay, 1,350 for Cordova Bay, 1,400 for Valdez Inlet and Resurrection Bay. The route to Lynn Canal is by an intricate and somewhat dangerous inland waterway, and the actual time consumed in the voyage is not very much greater to the western harbours than to Lynn Canal. As regards climate, there is little to choose between the various coastal terminals. Throughout the Pacific seaboard there is a heavy precipitation, varying from about 90 inches on Lynn Canal to about 125 inches in Prince William Sound. Heavy storms are usually from the south-west, and more commonly occur from October until May. As soon as the mountains are entered, very heavy snowfalls are to be expected. The coastal belt is usually heavily forested with timber which can be used in construction. (See maps, pages 293 and 300.)

PYRAMID HARBOUR, TANANA RIVER ROUTE

Chilkat River debouches into a western arm of Lynn Canal, called "Pyramid Harbour," and its

valley separates the Saint Elias Range on the west from the Coast Range on the east. A broad pass about 3,000 feet high, 50 miles from the coast, separates its head waters from inland-flowing streams. Beyond this pass the route would enter the Alsek basin and follow the inland front of the Saint Elias Range. Two forks of the Alsek will have to be crossed, but present no serious engineering difficulties. A series of depressions, part of a system of abandoned valleys, affords an ideal railway route beyond the west fork of the Alsek. The route would probably skirt the south shore of Lake Kluane 2,400 feet above sea-level and enter the White River Valley near the international boundary. After crossing White River at the canyon, the line would be extended through a broad, flat depression to the Tanana Valley, which would be followed to Fairbanks. There are no very heavy grades to be overcome in this route. Branch lines could be built to the copper deposits of the White River and to the Fortymile, Birch Creek, and Rampart placer districts. (See profile, page 286 and map, page 306.)

Pyramid Harbour, which affords shelter for vessels and opportunities for wharf construction, can be reached by a 1,000-mile journey from Puget Sound, entirely within sheltered waterways. The Chilkat basin is well timbered (chiefly spruce and hemlock) and contains some auriferous gravels, though the producing district lies somewhat off the proposed railway route. The copper deposits

of Rainy Hollow, which are undeveloped, lie about 20 miles off the main route. In the inland region there are no developed mineral resources except a small placer district. However, the meagre knowledge of the geology indicates that there may be here a continuation of the mineralised belt of south-eastern Alaska, and that workable ore deposits may yet be found. (See map, page 289.)

There can be no doubt that this is a natural route into the interior, and it was long used by the natives in their intertribal intercourse. It has one grave disadvantage, namely, that for about 300 miles it traverses Canadian territory, and would therefore not afford an all-Alaskan route. Under the custom laws, international railways are always at some disadvantage, though that this is not serious is shown by the many railways between Canada and the United States. Moreover, it would not help to develop the resources of the Copper River and Susitna River basins.

YAKUTAT BAY-ALSEK-TANANA RIVER ROUTE

The lower Alsek River Valley, which is transverse to the Saint Elias Range, affords a possible route into the interior. The line would run south-eastward from Yakutat Bay for about 50 miles, to the mouth of the Alsek. A narrow-gauge railway has already been built for about 10 miles of this distance, for the purpose of bringing fish to the salmon cannery at Yakutat. The Alsek

Valley is almost unexplored, but no doubt a railway could be built through it. It would intersect the Pyramid Harbour-Tanana route, about 200 miles from the coast, and would there attain an altitude of about 2,400 feet. (See profile, page 286.)

Yakutat Bay, which is about 1,150 statute miles (1,000 nautical miles) by sea from Puget Sound, is only a fair harbour, and, so far as known, the proposed railway would not tap any mineral deposits, though such may exist in the unexplored St. Elias Mountains. At 170 miles from Yakutat it joins the Pyramid Harbour route, and is open to the same objection, inasmuch as it passes through Canadian territory. (See maps, pages 300 and 306.)

CORDOVA BAY, OR CONTROLLER BAY, COPPER RIVER

Cordova Bay, an eastern arm of Prince William Sound, lies about 30 miles west of Copper River. A railway, now in construction, is to follow a route skirting the coastal margin of the mountains to the Copper River, and then, turning northward, to traverse the Chugach Mountains through the valley of that river. A distance of about 200 miles will bring it to the mouth of the Chitina, and with 100 miles more of track it will be able to tap the copper belt, which skirts the southern margin of the Wrangell Mountains. The route to the mouth of the Chitina follows the river grade, and there are no serious engineering difficulties, with the exception of the two bridges, 800 and 1,200 feet

in length, which will have to be built across the Copper to avoid the Miles and Childs glaciers.

A corollary to this plan is to construct a branch line about 35 miles in length from the Copper River to the Controller Bay coal field. (See maps, pages 306 and 310.)

A rival company has made a survey for a railway from near the mouth of Katalla River, 30 miles east of the Copper, which is to run north-westward to the head of the Copper River delta. A single bridge will be needed to avoid the glaciers, beyond which point the route will coincide with the one above described. This route has the advantage of the one above described, inasmuch as it is somewhat shorter and has to bridge the Copper but once. Katalla is only 1,200 miles distant from Puget Sound as compared with 1,350 for Cordova Bay. On the other hand, at Cordova there is an excellent natural harbour, while at Katalla a breakwater will have to be constructed. On the other hand, again, a harbour at Katalla would serve the Controller Bay coal-field. Whichever line is built, certain it is that there is not room for two railways along this Copper River route.

VALDEZ—COPPER RIVER ROUTE

An alternate plan for reaching the copper belt of the Chitina region is to build a railway from Valdez. Valdez Inlet, a north-eastern arm of Prince William Sound, is 1,400 miles distant from Puget Sound. Surveys have been made and some

* See map page 310.

construction work has already been done on two railway projects which are planned to cross Marshall Pass, about 1,900 feet high and 30 miles from Valdez, and thence down the Tasnuna River to the Copper. From the mouth of the Tasnuna the route would correspond with the route up the Copper River. The distance from Valdez to the mouth of the Chitina is about 20 miles less than that from Cordova, but a pass 1,900 feet in height has to be crossed; on the other hand, two expensive bridges over the Copper would not be needed. This line would not reach the Controller Bay coal-field. (See profile, page 286.)

Most of the railway projects into the Copper River have been planned with the ultimate object of extension into the Yukon Basin. Some of these have chosen Eagle, others Fairbanks, as their ultimate objective point. Of the two, Eagle appears to be the less logical, as a line built to it would pass through the eastern part of the auriferous district, while Fairbanks is much more central. (See map, page 306.)

From the mouth of the Chitina a line to Eagle would follow the Copper River Valley and cross to the Tanana through Mentasta Pass, 2,900 feet high. Crossing the Tanana Valley the line would enter an upland region not well known and would probably have to cross two passes, 3,000 feet high, before it descended to the Yukon.

A line to Fairbanks would be built up the Copper and Gakona river valleys across a pass 3,000

feet high, and down the Delta to the Tanana. Crossing that stream, it would continue down it to Fairbanks. (See profile, page 286.)

RESURRECTION BAY—SUSITNA VALLEY ROUTE

The upper waters of the Susitna River, which empty into Cook Inlet, are separated by a broad, low pass, about 2,400 feet high, from the Ninana, or Cantwell, River, which flows into the Tanana. This is one of the lowest depressions in the watershed between the Pacific and the Yukon. (See map, page 306.)

Unfortunately the upper part of Cook Inlet is closed by the winter ice, so that a coastal terminal would have to be sought on the east side of the Kenai Peninsula, which separates Cook Inlet from the Pacific. Such a one has been found in Resurrection Bay, an excellent harbour, 1,400 miles distant from Puget Sound. Here the town of Seward was located two years ago and construction begun on the so-called Alaska Central Railway, of which about 50 miles has been completed and considerable work done on 20 miles more.* This route stretches northward from Resurrection Bay and, crossing a pass, about 1,000 feet high, about 40 miles from the coast, descends again to tide-water at the head of Turnagain Arm. After swinging around Turnagain Arm, it bends northward, crossing the Matanuska near its mouth. Here a branch is to be built to Matanuska† coal-field, the immediate objective

* See profile, page 286.

† See map, page 296.

point of the railway. It is proposed to extend the Yukon trunk line up the Susitna, across the depression above mentioned, down the Cantwell to a terminal which will be on the south side of the Tanana River, near Fairbanks. The total mileage from Resurrection Bay to Fairbanks is about 500. While this route is one of the shortest from the coast to Fairbanks and also has the best grades, it does not tap the copper deposits of the Copper River, and, with the exception of the Matanuska coal-field and some placer districts, does not traverse an area now known to carry mineral in commercial quantities. (See maps, pages 289 and 296.)

CONCLUSIONS

The matter presented shows that there is justification for a trunk line railway from the Pacific seaboard to inland points, for it is only by rendering accessible the vast mineral wealth of the interior that its full measure of development can be attained. It is evident that the value of such a trunk line would depend on the construction of many branches and feeders, which have not here been considered. Furthermore, these railways must be supplemented by many wagon roads.

The history of railway expansion in the United States has shown that the natural development is, first, railroads built supplementary to established lines of water transportation; second, the binding together of such auxiliary lines by a trunk

system. In Alaska the same evolution is witnessed. The White Pass and Yukon Railway, traversing the coastal barrier, links tide-water with navigable waters of the Yukon system. The heavy traffic being all down stream, what should be a comparatively cheap form of transportation is established to Dawson, a distance of 700 miles. A placer field such as the Klondike yields practically no outgoing tonnage. When, however, lode or coal mines are developed, there is a return traffic which the upstream river steamers cannot handle economically. Moreover, freight shipped to Alaskan points on the Yukon must run the gamut of two custom-houses, with all the attending annoyances of delays and formalities. It should be remembered, too, that the route to Fairbanks *via* the White Pass Railway involves the transshipment of freight at White Horse to Canadian steamers, a journey of 500 miles to Dawson, then a transshipment to American boats and another journey of 800 miles, of which 200 miles is up stream. If good connections are made, some eight days are consumed in going from tide-water on Lynn Canal to Fairbanks, which by a direct line could be reached in 450 miles. As a rule, freight is at least a month in transit. The journey up the river, while it avoids one transshipment, involves changing from ocean vessels to river steamers at the mouth of the Yukon, and then a 1,200-mile upstream journey. Moreover, these routes are only open from the first of June

to the middle of September. It would seem, therefore, that if the resources of the Yukon are sufficient to warrant the construction of a railway, such a railway should hold its own against the competition of water transportation. In any event a railway into the Susitna-Copper River province would encounter no competition with steamboat transportation.

Considered geographically, the routes described fall into two classes, namely, the one comprising those parallel to the lines of height, and the other those transverse to the lines of height. In the first group belong the trans-Alaskan-Siberian line, the Lynn-Canal-Fairbanks line, together with its alternate, the Alsek-Fairbanks line. (See map, page 306.)

These routes, as has been shown, are parallel to the dominant axes of uplift, and therefore harmonious with the topography. As a matter of fact, however, pioneer railways are usually transverse to the watersheds, for the reason that they are located to supplement and not to supplant water transportation. The history of railway development in the United States shows that piedmont lines are the last to be built. A railway parallel to the inland front of the St. Elias range would traverse a series of abandoned valleys such as are everywhere recognised as ideal topographic conditions.

Geographically, therefore, these routes would appear to have the advantage, and would, moreover, render accessible a large area in the interior

of Alaska and northwest Canada not reached by any railways of the other group. When, however, the *developed* resources are considered, they are at a disadvantage, for, while they would tap the upper copper-bearing region, they would reach neither the valuable southern copper belt nor the coal-fields.

The transverse lines, including the Copper and Susitna routes, appear, as has been shown, to follow the laws which govern the location of pioneer railways, that is, they cross the watersheds and connect existing lines of water transportation.

In any event, it is clear that a properly located transverse line must follow one of the rivers which traverse the coast ranges. Two such railways, one up the Copper and one up the Susitna, are already under construction. The rival interests financing the two projects have been loud in claiming that each route was the best. In point of fact, the two supplement each other. It is certain that a railway by way of the Copper River follows the only feasible route to copper deposits of the Wrangell region. It is equally certain that as a route to the Yukon a railway up the Susitna River has the best of it. Again, neither of these lines bisects Alaska as would a railway extending from Lynn Canal to Fairbanks and to the Seward Peninsula.

The matter presented in the foregoing pages indicates that more facts are needed before

scientific deduction can be drawn of the best route for *immediate construction*. Meanwhile, however, in view of the large amount of capital ready for investment in any promising enterprise, it is only too likely that the problem will be solved by experimentation alone, as has been done at great cost elsewhere; in other words, by the survival of the fittest.

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